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ABSTRACT

As one in a series of test item collections developed by the Assessment and Evaluation Unit of the Directorate of Studies, items are made available to teachers for the construction of unit tests or term examinations or as a basis for class discussion. Each collection was reviewed for content validity and reliability. The test items meet syllabus content and aims best suited to multiple choice questions, but teachers are meant to base the use of the test items on student ability and the particular program objectives in grades 7 through 10. Test items which relate to the skills in collecting and analyzing scientific information are presented. A knowledge of basic concepts in specific sciences is necessary in some items, but the questions are concerned particularly with the comprehension of scientific information in formats such as tables and graphs, the principles of conducting experiments, and the characteristics of scientific methodology. There are 202 test items. Answers are provided with each item, and drawings and graphs illustrate many questions. (CM)

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New South Wales Department of Education

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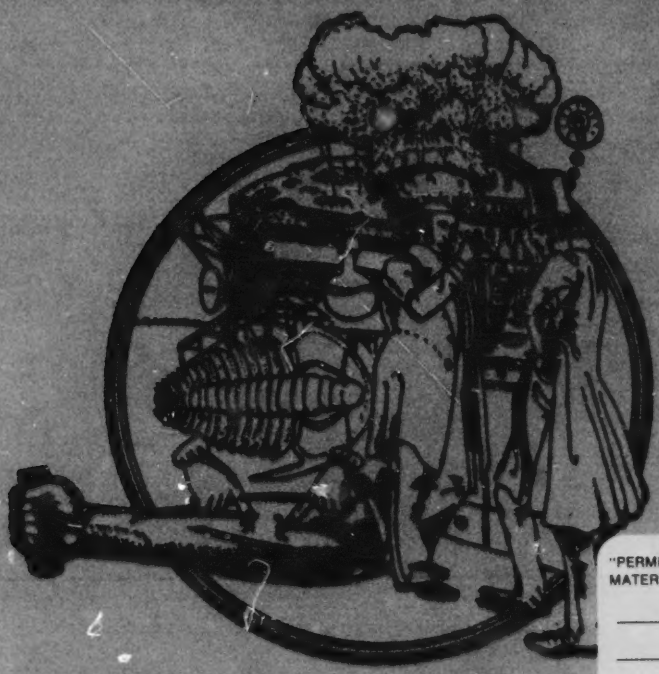
SCIENCE



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A COLLECTION OF MULTIPLE CHOICE TEST ITEMS RELATING MAINLY TO

SKILLS

OLUME TWENTY TWO OF THE SCIENCE LIBRARY OF TEST ITEMS

VOLUME TWENTY TWO OF THE
SCIENCE LIBRARY OF TEST ITEMS

SKILLS

Also in this series.....

Volume 17	BIOLOGY
Volume 18	CHEMISTRY
Volume 19	GEOLOGY
Volume 20	PHYSICS (1)
Volume 21	PHYSICS (2)

Produced by the
School Certificate Development Unit
Directorate of Studies
Department of Education
New South Wales
1981

INTRODUCTION

This is the sixth of the 6 volume series of multiple choice test items in the Science Library of test items produced in 1981.

This volume contains questions which relate to the ways in which scientific information is collected and analysed. As such the questions are (theoretically) "content free" and should be able to be correctly answered of all students who have the necessary skills. The questions do of course, appear to have a biological or physics content depending on the setting of the stimulus material, and, in fact, some will require the student to have some knowledge of basic concepts.

For example, question 81 asks students to read a graph to determine which car will stop first. Provided the student understands the concepts of velocity and acceleration this question *is* simply a graph reading question. If the student does not understand these concepts though, then his or her ability to read the graphs may be of no use.

A few of the items in this volume *also* appear in the corresponding content volume, so some care will be needed to avoid duplication of items in tests.

Finally, once again, if there are areas which you think a collection such as this should cover which are not covered please let us know. All comments, suggestions, contributions and criticisms (hopefully constructive) should be addressed to:

The Subject Officer (Science),
School Certificate Development Unit,
P.O. Box 460,
NORTH SYDNEY. 2060.

Good Testing!!

Acknowledgements

Many teachers have been involved in developing the library of test items. As with any list of credits, there will always be some who are inadvertently overlooked. To these we extend our apologies.

Those who appear in our files, in alphabetical order, appear in the list below. To these, our thanks and appreciation for work done and the hope that we will continue to receive your support in the future:

NAME	SCHOOL
Chris ANGUS	Granville South High School
Janet ANDERSON	Tumbarumba High School
Peter BAKER	Macintyre High School
Mary BLACKBURN	Westfields High School
Paul BLACKBURN	Westfields High School
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Peter SWAN	Macintyre High School
Lorraine STEVENS	Murray High School
Jo WESSEN	Granville High School
J.F. WHEELDON	Wagga Wagga High School

And a special thanks to the girls at S.C.D.U. who have typed without (audible) complaint as we have constantly changed question after question.

JAN ANGLIM
ALISON ADLARD
SHARON WEBB
WENDY HOME

Editorial and Review Committee

Mary BLACKBURN
Kim FILLINGHAM
Brian JARMAN
Peter MACINNIS
Kevin MOLYNEUX
Brian SHADWICK
Jim STAMELL

DEVELOPMENT OF THE LIBRARY

This collection of material is intended as a resource to assist teachers to implement and evaluate courses in the first four years of secondary school.

Because the questions were submitted by classroom teachers from both Government and non-Government schools in all parts of the State, they constitute a cross-section of the ideas which currently pervade classroom practice.

To ensure quality in the collection, only those items which satisfied several quality control checks have been included. Foremost among these were:

(i) inspection by a panel of experienced, practising teachers;

(ii) a pretest with a representative selection of Years 7-10 students.

As well as sharing in the general editing and reviewing functions, the review panels checked each item for *content validity*. The pretest was used to establish the *efficiency* of the items as measuring instruments. Three of the major statistical criteria used were:

(i) Item Facility: The facility index measures the proportion of the sample candidature who answered the question correctly. All items in this collection have a facility index between 0.30 and 0.90.

(ii) Item Discrimination: This index measures the degree to which success on the item is correlated with success on the total test of which the item is a part. A commonly used index of discrimination is the point-biserial correlation coefficient. Every item in this collection attained a point-biserial correlation coefficient of at least 0.20. This means that on the pretest, each item added significantly to the total score of information about the relative achievement of the candidature.

(iii) Distractor Efficiency: With each item, each distractor was chosen by at least 5% of the total candidature, except in the case of very easy items, where an even spread of respondents was sought.

For the test to be *reliable*, many features apart from these three must be considered. However, the proven quality of these items, as measured by these three criteria, makes it highly likely that any test chosen from this collection, and administered to *appropriate* classes, will be a more reliable instrument than teachers could normally produce without this assistance.

USING THE COLLECTION

Items in this collection may be reproduced for classroom use in any form desired by the teacher. To facilitate the preparation of printing masters particular attention has been given to both the diagrams and the layout of the items.

To assist the teacher, the items have been classified according to the content being tested and two pieces of information are provided:

(i) the key (or correct option), and;

(ii) the difficulty rating (1-5), which is based on the data obtained during the pre-testing program. A question rated "1" was correctly answered by some 30-40% of students, while "5" indicates a correct response by 80-90% of students in the pre-test sample. Recent investigations have shown that while this information is useful as a general guide, item difficulties vary greatly when items are given to classes who have recently studied the material covered in given items. The ratings should not be confused with norms or goals: they are merely useful guidelines for teachers.

It is suggested that items might be used for the following purposes:

1. As a source of items for short unit tests.
2. As a source of items for term tests.
3. As a source of ideas for in-school item construction.
4. As a basis for class discussions (it should be noted that stimulus material was NOT designed for use with the overhead projector. The letter size used in typing items would not be legible at more than 4 metres from the screen in an average classroom).

One important warning should be given to all teachers using this collection. Some areas of syllabus content and some syllabus aims are better suited to testing with multiple choice items than others. Consequently, this collection is unlikely to be balanced in its coverage. In addition, the inclusion of an item is not intended to imply that a particular piece of content or teaching strategy has a place in the curriculum. The final selection must lie with the teacher in the classroom who knows the interests and abilities of his students.

Comments, criticisms and suggestions from teachers are welcome. All correspondence should be addressed to :

The Subject Officer (Science),
Directorate of Studies,
Box 33 G.P.O.,
SYDNEY. 2001.

CONTENTS

The contents of this volume have been grouped, like the contents of the other volumes, into broad categories only.

In this volume questions tend to overlap their classification groups more than in the others. This particulary applies to sets of questions which refer to the same stimulus material.

No attempt has been made to identify the "Physics, Chemistry, etc" orientation of the questions within each group, although they tend to be together.

It is in this volume more than the others where teachers may disagree with our classification. It may be advantageous to take more care with the selection of these items for inclusion in tests to ensure that the skills they porport to test have been, in your opinion, correctly identified.

COMPREHENSION of information in tables, graphs, etc. ____ 7

EXPERIMENTAL METHOD

- Selecting Apparatus ____ 53
- Method ____ 60
- Analysis of Results ____ 72
- Making Conclusions ____ 78

SCIENTIFIC METHOD ____ 92

COMPREHENSION

This question refers to this table:

Planet	Approximate distance from Sun in millions of kilometres	Approximate diameter in kilometres
Mercury	58	4960
Venus	108	12320
Earth	150	12683
Mars	227	6720
Jupiter	775	125920
Saturn	1430	120160
Uranus	2860	46880
Neptune	4500	44320
Pluto	5900	estimated 6400

If the diameter of a planet was the only factor influencing the gravity of that planet, which planet(s), listed above would have a gravity closest to that of Earth?

A. Mercury. B. Venus. C. Mars and Pluto. D. Neptune.

B.4 1

The next two questions refer to this table which was drawn up after testing five foods with four testing substances each.

FOOD SUBSTANCES	FOOD TESTING SUBSTANCE			
	Biuret Reagent	Benedicts solution	Iodine solution	Sudan III
Egg (protein)	✓	×	×	×
Butter (fat)	×	×	×	✓
Bread (starch)	×	×	✓	×
Glucose (sugar)	×	×	×	×
Cheese	✓	×	×	✓

KEY: ✓ Reacts when warmed.
× No reaction when warmed.

The food testing substance which would best show the presence of sugar in a food would be

A. Biuret Reagent.
B. Benedicts solution.
C. Iodine solution.
D. Sudan III. 2

B4.

Cheese is a food which has the following food substance/s

A. protein only.
B. fat only.
C. protein and fat only.
D. aged butter fat only. 3

C4.

Following is a common form of kilometre chart showing the distances between major centres. This particular one is an extract from the back of a N.S.W. road map. Study the chart carefully and answer the question which follows it.

NOTE: NO instruction as to how to read this table was given with the road map.

BATEMANS BAY											
347	BATHURST										
158	505	BEGA									
893	598	978	BOURKE								
1158	953	1220	542	BROKEN HILL							
262	202	420	783	1157	CAMDEN						
152	297	238	726	1125	253	CANBERRA					
1082	753	1238	917	1460	912	1082	CASINO				
473	350	635	780	1305	223	462	613	NEWCASTLE			
125	340	283	922	1150	137	232	862	550	NOWRA		
353	57	505	557	895	258	312	812	408	398	ORANGE	
292	217	450	813	1155	65	318	795	185	167	273	SYDNEY
723	375	970	587	1067	462	718	458	598	598	433	453 TAMWORTH

The distance from Bathurst to Casino is 753 km. Of the following, how much further is the distance from Bathurst to Broken Hill compared with the distance from Bathurst to Casino? Is it

A. 200 km.
B. 577 km.
C. 300 km.
D. 263 km.

A.4

4

Here are the average sizes of some things. The unit of measurement is the millimicron, which is one millionth of a metre.

THING	AVERAGE LENGTH (in millimicrons)
small animal cell	9,000
wavelength of yellow light	600
pleuropneumonia organism	150
average virus	60
largest known chemical molecule	22

Some scientists are not sure whether to classify viruses as living or non-living things.
On the basis of the information in the table, we can say that viruses

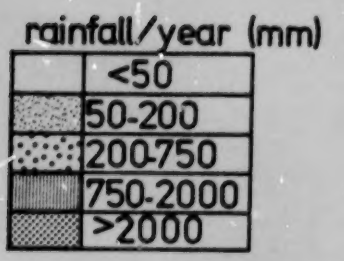
A. are living things.
B. are non-living things.
C. could be either living or non-living things.
D. are living because they cause diseases.

C3.

5

The next three questions refer to the following information.

The map below shows a region on the planet Xenos and the rainfall distributions over the region.



In which region would you expect to find the Xenos equivalent of rainforest?

A. 1
B. 2
C. 3
D. 4

A.2

6

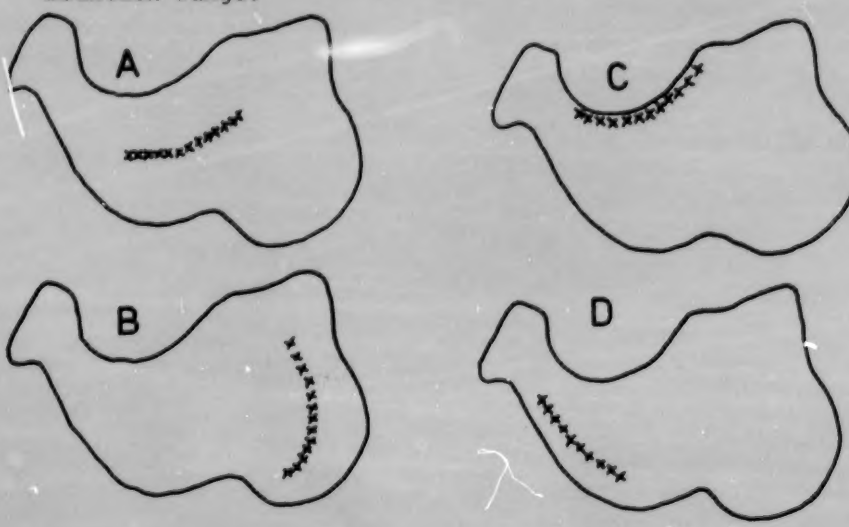
Some plants from Earth are being tried out on Xenos. Which of the plants below would you most expect to succeed in region 3?

A. grasses
B. ferns
C. gum trees
D. pine trees

A.1

7

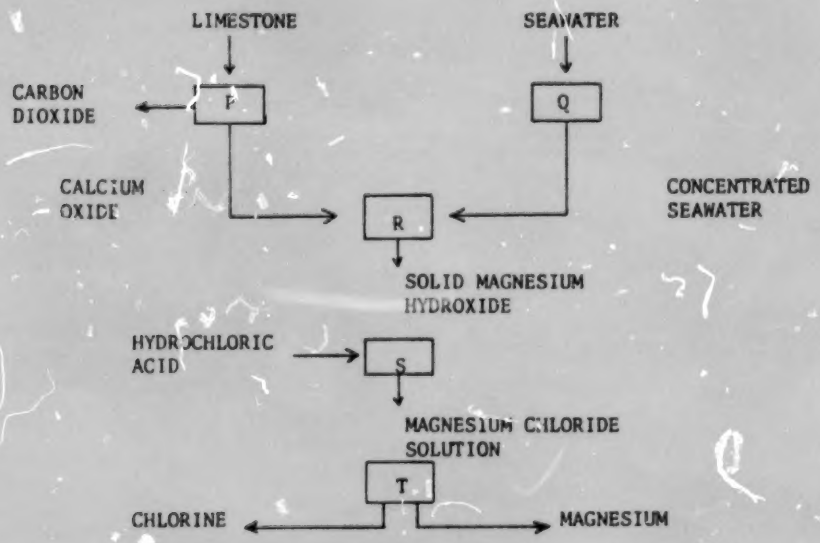
Which map below best shows the most probable position of a mountain range?



B.2

8

The diagram below contains the information for the next three questions.



This flow diagram shows one of the industrial processes used to extract magnesium metal from seawater. The letters P, Q, R, S and T refer to changes that occur.
This is not one of the processes that you have studied. You are expected to use the knowledge gained during your study of other processes to answer these questions.

Which change would be a precipitation reaction?

A. P.
B. Q.
C. R.
D. S.

C.2 9

In which change would an acid-base reaction occur?

A. P.
B. R.
C. S.
D. T.

C.3 10

Which change would use electrolysis?

A. P.
B. Q.
C. S.
D. T.

D.3 11

The next four questions refer to this newspaper report.
Read the article carefully and then answer the questions below.

RUSSIAN CRAFT ON VENUS

MOSCOW, Wednesday - An unmanned Soviet spacecraft landed today on Venus after a five-month journey.

The Soviet news agency Tass said the descent vehicle of the Venus 9 craft made a soft landing on Earth's nearest planetary neighbour obtaining "a unique image of the surface".

The mother spaceship remained in orbit around the planet.

The landing vehicle took the first pictures from the surface of the planet. They were relayed back to Earth by the mother craft.

Moscow Radio said that transmissions lasted for 53 minutes, which could mean that the equipment may then have failed.

The descent craft did, however, analyse the soil, which may give valuable clues on the evolution of Venus.

(AAP-Reuter).

Sydney Morning Herald 23/10/75

The reason why the mother ship stayed in orbit around Venus was to

A. track the progress of the descent vehicle.
B. power the cameras of the descent vehicle.
C. transmit information back to Earth.
D. control the movement of the descent vehicle.

C.3 12

The fact that the transmission lasted only 53 minutes suggests that the

A. craft was damaged on landing.
B. equipment collecting information failed.
C. batteries powering cameras were flat.
D. vehicle ran out of fuel.

B.3 13

Some reasons for sending a space craft to Venus may be

X - it is our closest planet
Y - scientists want close up pictures of its surface.
Z - scientists are interested in how Venus formed.

Of these reasons the article mentions -

A. X and Y.
B. Y and Z.
C. X and Z.
D. Z, X and Y.

D.2

14

Even though Venus is our closest neighbouring planet the spaceship still took 5 months to get there. One reason to explain the long time for the journey would be

A. close objects in space are many millions of kilometres apart.
B. Venus was on the opposite side of the Sun to the Earth.
C. scientists have not yet found the shortest route to Venus.
D. the spaceship had to travel slowly to conserve fuel.

A.4

15

VERTEBRATE	NUMBER OF OFFSPRING	METHOD OF REPRODUCTION	EGGS LAID	CARED FOR BY PARENTS	BODY COVERING
Fish	Hundreds	Sexual	Yes	No	Scales
Amphibians	Hundreds	Sexual	Yes	No	Slimy skin
Reptile	Forty	Sexual	Yes	No	Horny scales
Bird	1 - 5	Sexual	Yes	Yes	Feathers
Mammal	1 - 10	Sexual	No	Yes	Hair

From the information given the best explanation of the lower numbers of offspring produced by birds and mammals is

A. the method of reproduction.
B. whether eggs are laid or not.
C. whether the young are cared for by parents.
D the type of body covering of the animal.

C.2

16

The next 4 questions refer to the following information.

One of the many problems faced by farmers is the continual growth of weeds in pastures. The weeds, which generally have poor nutrition value for stock (sheep, cattle, etc.), will grow at the expense of more useful stock food, if not continually checked. A method of control, which is both scientifically and economically sound, is to provide conditions in the pasture which useful grasses and clovers can take advantage of more readily than can weeds.

One such method depends on first raising the soil fertility and sowing types of grasses and clovers which will benefit more from the increased fertility than will the weeds. In this way, the weeds will gradually cover a decreasing proportion of the pasture. For example, the fertilizer superphosphate, and the pasture plant subterranean clover, have helped to combat the weed, St. John's wort.

Another method of control depends on the fact that some weeds grow quite quickly in a newly sown pasture. If two grasses, one a quick growing variety, are sown in a pasture together, the first can be harvested before the other has reached a stage of growth where it will be affected by the harvesting. However, a quick growing weed will suffer a severe setback because this harvesting will remove much of the weed plant before it has had time to seed or become firmly established.

Which one of the following facts about weeds is <u>NOT</u> contained in the above statement?

A. Some weeds grow quite quickly in newly sown pastures.
B. The growth of weeds is generally combatted by the planting of subterranean clover.
C. Weeds generally provide little of nutritious value for sheep.
D. The continual growth of weeds in pastures is a problem for many farmers.

B.2 17

The main effect of applying superphosphate to a pasture is that it

A. lowers the resistance of St. John's wort.
B. increases the soil fertility.
C. increases the growth rate of subterranean clover.
D. restricts the growth of weeds.

B.1 18

Two more questions appear on the next page.

The first two questions on this page refer to the information on the previous page.

If both quick growing and slow growing grasses are planted in a pasture then after the quick growing grasses have been harvested the slow growing grasses will have

A. only slow growing weeds to compete with.
B. no weeds to compete with.
C. only quick growing weeds to compete with.
D. both slow growing and quick growing weeds to compete with.

A.2 19

Suppose there are two identical boxes of low fertility soil, one in which St. John's wort is growing, and the other in which subterranean clover is growing. If superphosphate is applied to the soil in both boxes, which one of the following is the most likely outcome?

A. The growth rate of the clover will increase but the growth rate of the St. John's wort will decrease.
B. The growth rate of the clover and the St. John's wort will both increase by the same amount.
C. The growth rate of the clover and the St. John's wort will both increase but the increase will be greater in the case of the St. John's wort.
D. The growth rate of the clover and the St. John's wort will both increase but the increase will be greater in the case of the clover.

D.1 20

Equal quantities of four liquid fuels were tested for their properties during combustion. The results are shown in the following table.

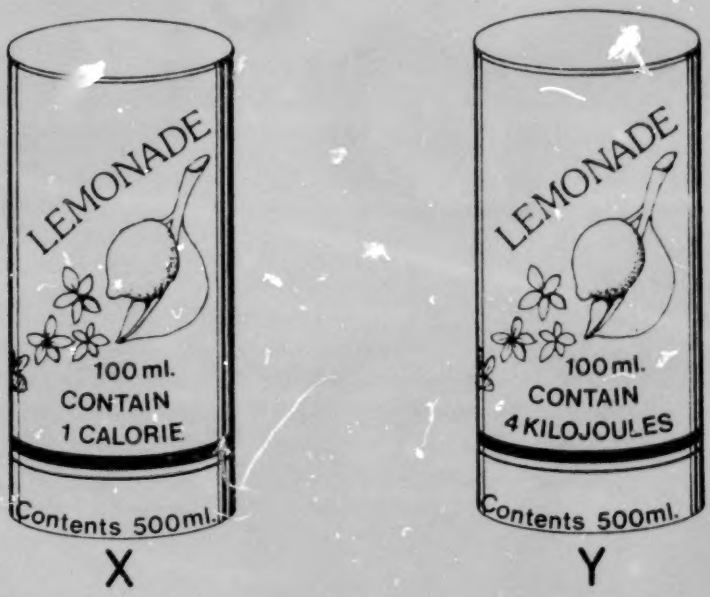
Fuel	Flame	Smoke	Burning Time	Heat Energy
A	orange	dense black	moderate	low
B	yellow	wisps of soot	long	low
C	blue	none	moderate	moderate
D	yellow	none	long	moderate

D5

Which fuel would be most suitable for giving light from a wick burning lamp? 21

The energy available from foods and drinks is measured in CALORIES. Soon the KILOJOULE will be used instead of the CALORIE. We know that 4 KILOJOULES equal 1 CALORIE.

Examine the labels on the cans drawn below.



From the information on the labels which of the following is a true statement?

A. X contains more lemonade than Y.
B. A glassful of lemonade from X will provide less energy than the same size glassful from Y.
C. Lemonade from X will taste better than lemonade from Y.
D. The energy content of the lemondade in both cans is the same.

D5.

Australia's tallest timber tree, *Eucalyptus regnans*, is called "mountain ash" in Victoria and "swamp gum' in Tasmania. Yet to a Victorian "swamp gum" refers to another eucalypt, *Eucalyptus ovata*. The name "mountain ash" is used in Britain for a totally different plant which belongs to the apple family.
From this information we can say that

A. A Victorian and an Englishman both talking about a "mountain ash" would be talking about two different trees.
B. A Victorian and a Tasmanian both talking about *Eucalyptus ovata* would be talking about the same tree.
C. Scientific names are necessary for "scientific exactness".
D. All of the above are correct.

D2

23

This question refers to this table.

	Carbohydrates	Fat	Protein	Vitamins	Minerals
Milk	✓	✓	✓	✓	✓
Beer	✓	-	-	-	-
Fruit	✓	-	-	✓	✓
Nuts	✓	✓	✓	✓	✓
Sweets	✓	-	-	-	-
Fish	-	✓	✓	✓	✓
Meat	-	✓	✓	✓	✓
Eggs	-	-	✓	✓	✓
Potatoes	✓	-	-	✓	-
Pastry	✓	✓	-	-	-

From this information in the table above which foods *appear* to provide the best nutrition?

A. Fish and meat.
B. Fruit and eggs.
C. Meat and potatoes.
D. Milk and nuts.

D3. 24

Read the following poem and answer the question which follows:

PARTNERS by Ivan Currutherinski

I am the breeze
and I scurry to and fro
to make the clouds go, scudding
from the seas to the land.
I travel everywhere
with my striped friend
the busy, buzzing lady.
We are friends, the lady and I.
Without us the wattle tree
would never live to see the day.
No gum tree or giant oak
would grace the earth
without our toil.

Of the following, the process whereby the breeze and the "busy,buzzing lady" could be regarded as <u>partners</u> would most likely be

A. growth.
B. reproduction.
C. assimilation.
D. responding.

B.2 25

The next question refers to this advertisement.

Analytical Chemist

We need an Analytical Chemist who has had about five years' postgraduate experience to join the Analytical Section in our Research Department, Botany.

The job is a challenging one as the problems we get are usually in the difficult category, we are also interested in all aspects of environmental control. Apart from a good knowledge of modern instrumental procedures, we would expect that applicants show aptitude in developing new equipment and new procedures and in addition be capable of leading small teams.

The starting salary will be commensurate with experience. Increases in salary depend upon performance and are reviewed regularly.

If you are interested in a job which will keep you on your toes, then write to:

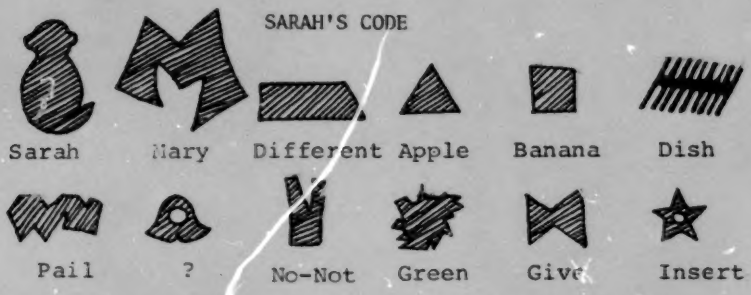
The company considers one quality very important. The company is particularly looking for a scientist who

A. can carry out routine analytical operations.
B. has just graduated from university, and so will be very keen.
C. is able to produce imaginative solutions to problems.
D. knows about modern instruments.

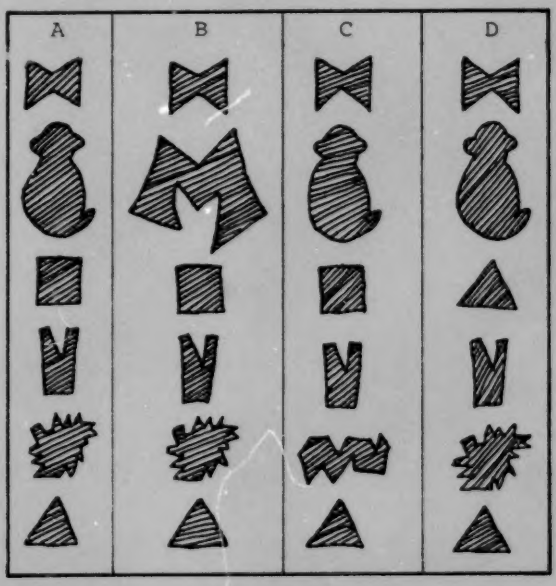
C3.

The next question refers to this information.

SARAH'S CODE



Sarah is a seven year old chimpanzee, who has learned to recognise and use more than 120 different symbols. Some of these, appear above. Which set of symbols below means "Give Sarah a banana, not a green apple."



A5.

27

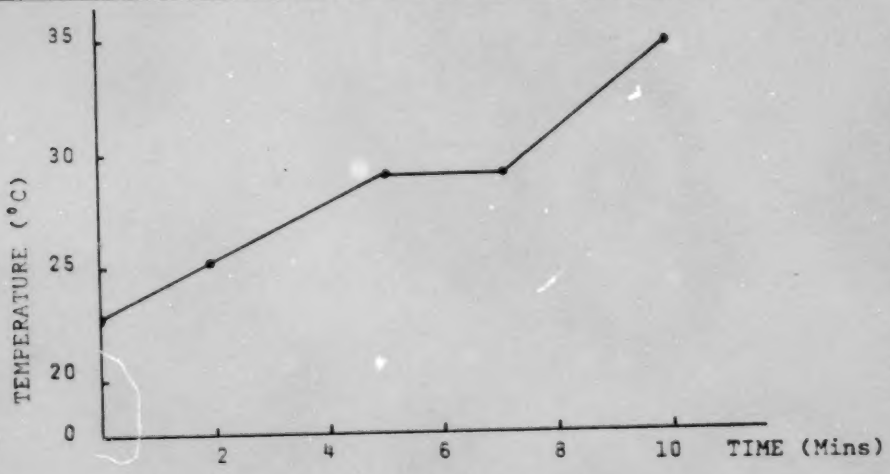
Four students worked together on an experiment in which they studied the heating of a solid. Temperature changes and time of heating were noted. They recorded their results in different ways as shown below.
The one which allows the reader to see *most quickly and clearly* how the temperature of the solid changes with time is:

A.

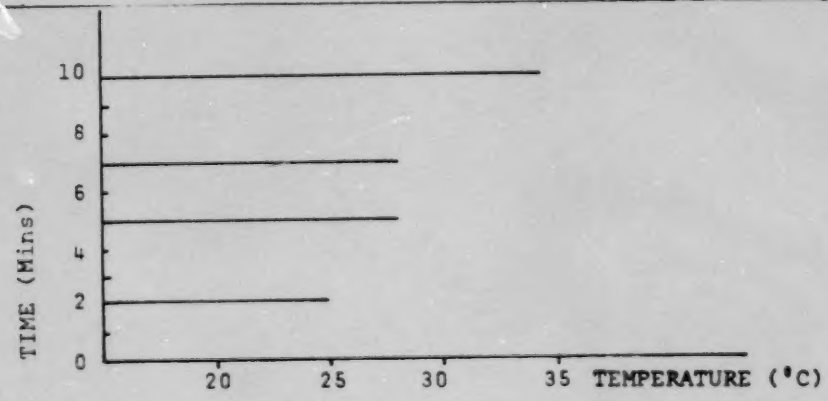
TIME (Minutes)	TEMPERATURE (°C)
0	23
2	25
5	28
7	28
10	34

B. It took two minutes for the temperature to rise from 23°C to 25°C, then 3 minutes for it to rise to 28°C. During the next two minutes the temperature remained constant, but in the next 3 minutes it rose to 34°C.

C.

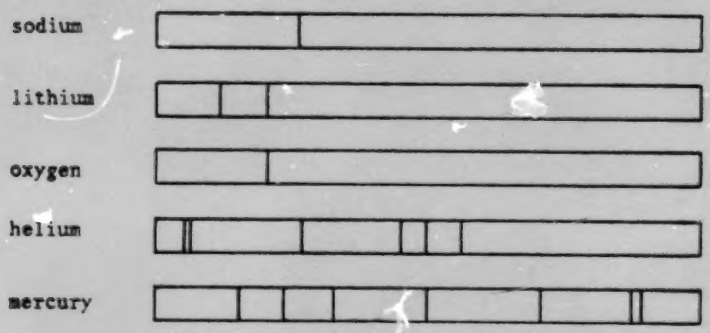


D.

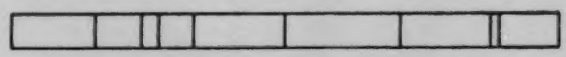


Scientists can find out what elements are present in stars by looking at the spectra of stars. Spectra are a series of lines which appear on a photographic film.

Spectra of some elements are given below:



A star gives this spectrum:



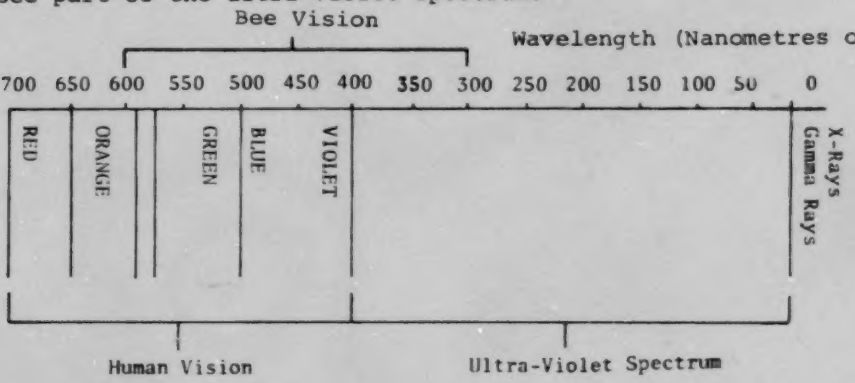
The elements present in the star are:

A. sodium and mercury.
B. lithium and mercury.
C. oxygen and mercury.
D. helium and mercury.

A3.

29

Ultra-violet radiation is invisible to human eyes, although bees see part of the ultra-violet spectrum.



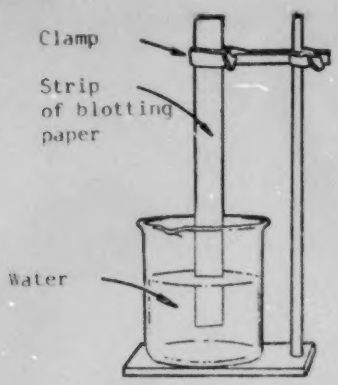
What wavelengths of light can both humans and bees detect?

A. 400 nm - 300 nm.
B. 600 nm - 300 nm.
C. 600 nm - 400 nm.
D. 700 nm - 300 nm.

C3.

30

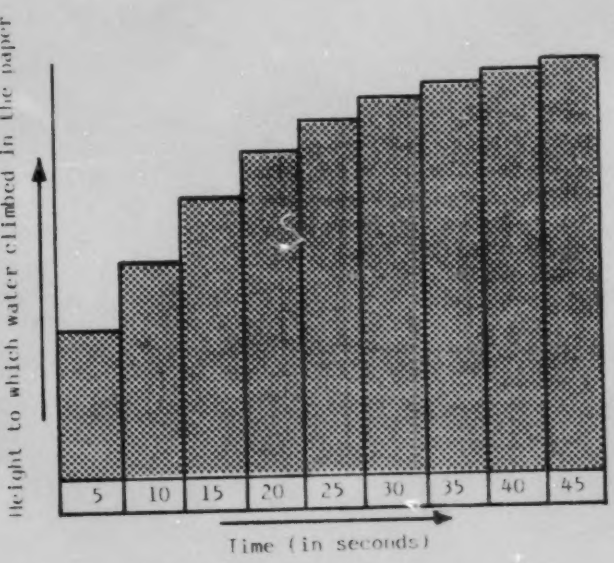
The next question refers to the diagram below.



A student held a strip of blotting paper as shown in the diagram.

Every 5 seconds he measured how high the water had risen in the paper.

He then used these measurements to draw the graph below.



The graph shows that

A. the water level rose quickly at first, but more slowly as it climbed higher in the paper.

B. the water level rose more quickly in blotting paper than in other types of paper.

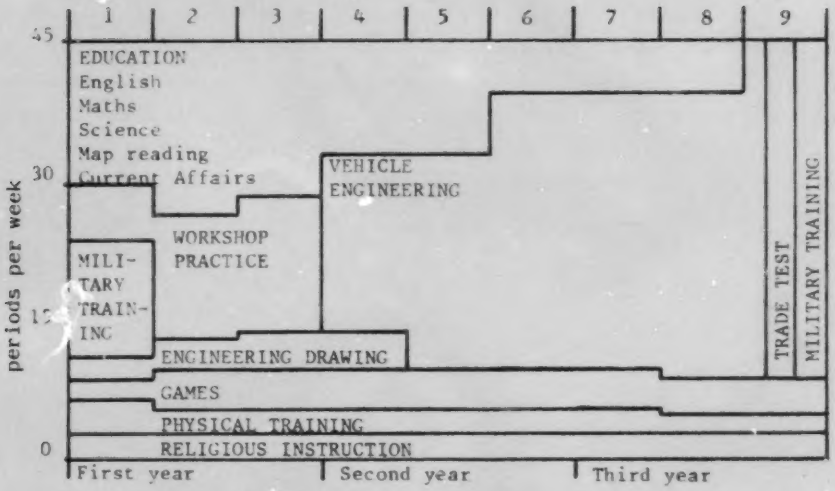
C. the water evaporated faster near the top of the paper than near the bottom.

D. the water level would begin to fall again after 45 seconds.

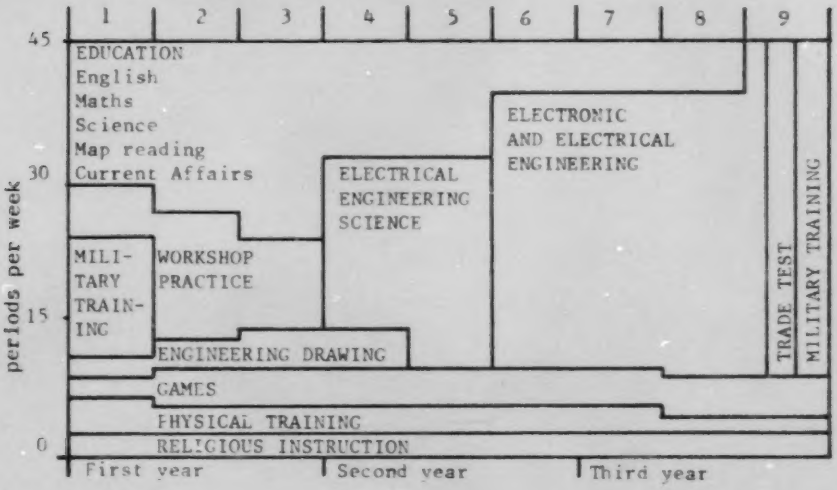
31

The next four questions refer to the diagram and information shown below.

ARMY APPRENTICES SCHOOL/ABORFIELD
Mechanical Trades



Electronic and Electrical Trades



The diagrams show the composition of two courses at the army school in terms of numbers of periods spent per week on each subject.

The questions appear on the following page.

Which course is NOT common to both trades?

A. Engineering Drawing.
B. Map Reading.
C. Physical Training.
D. Vehicle Engineering.

32

An army cadet doing the Electronic and Electrical trades course would be most useful in which job?

A. Car production workshop.
B. Engineering design firm.
C. Garage mechanic.
D. Radio repair shop.

33

In these courses, which subject takes up most class time?

A. Education (Mechanical trades).
B. Education (Electronic trades).
C. Vehicle Engineering.
D. Electronic and Electrical Engineering.

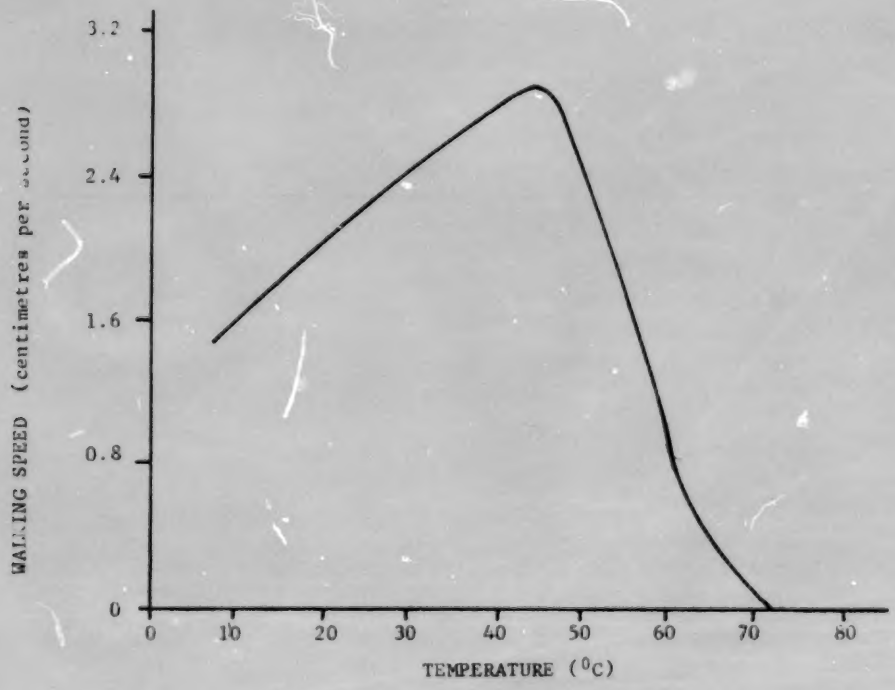
34

How many periods per week are spent on military training in the first term of the first year mechanical trades course?

A. 8 B. 12 C. 18 D. 24

35

The graph below shows how the walking speed of ants varies with the temperature of the surroundings.



The greatest change in walking speed of ants occurs in the temperature range between

A. 10°C and 30°C.
B. 30°C and 50°C.
C. 50°C and 60°C.
D. 60°C and 70°C.

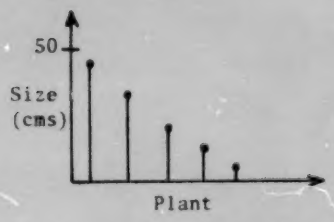
36

Five types of plants are grown from seeds in a laboratory. The student found that a pea plant grew 20cms in 10 days and had white flowers. A broad bean plant grew 28cms in 10 days and had white flowers. A cabbage grew 8cms in 10 days and had yellow flowers. A mustard plant grew 42cms in 10 days and had yellow flowers. A wattle tree grew 6cms in 10 days and had orange flowers. The student then drew up a table to show *ONLY the rate of growth of the fastest and slowest* plants he had studied. The clearest table in the following group which best shows the information he wished to present is:

A.

Rate	Plant	Growth Rate
Slowest	Wattle	0.6 cms/day
Fastest	Mustard	4.2 cms/day

B.



C.

Speed	Plant	Rate
Slowest	Wattle	0.6
Fastest	Mustard	4.2
Medium	Bean	2.8
	Pea	2.0
Next Slowest	Cabbage	0.8

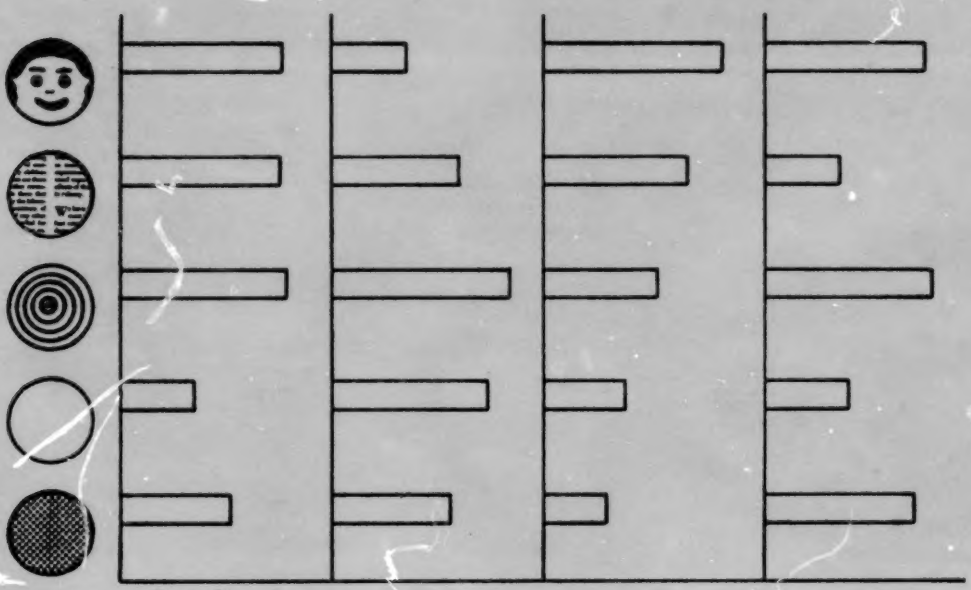
D.

	Plant	Flower Colour	Growth Rate
Slowest	Wattle	Yellow	0.6 cms/day
Fastest	Mustard	Orange	4.2 cms/day

37

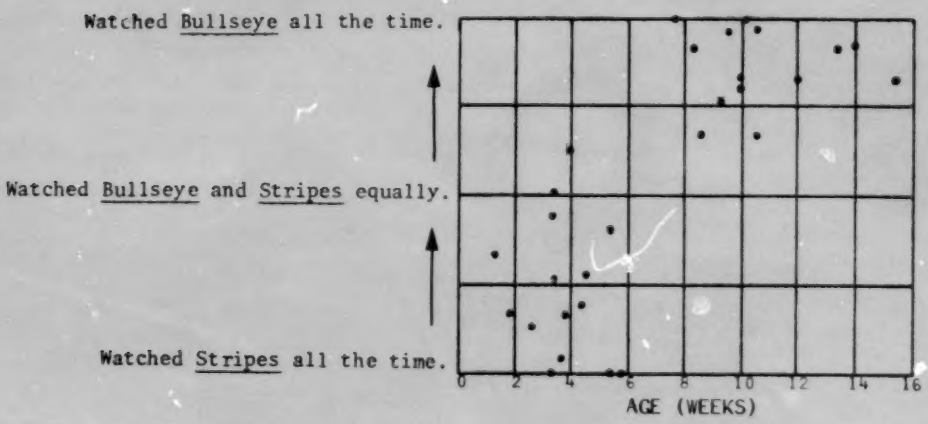
The following question refers to the bar graphs on the previous page.

On the basis of the information shown in the graphs on the previous page, which of the graphs below would you expect to be the results of an experiment where infants are looking at the patterns shown?



AVERAGE SECONDS OF WATCHING IN A ONE-MINUTE TEST

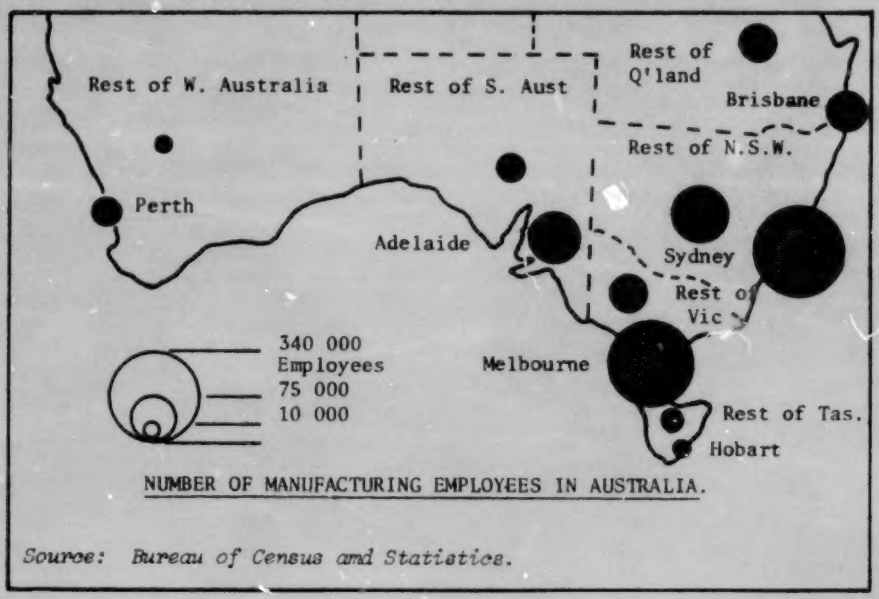
The next question refers to the graph below.



The graph shows the amount of time babies looked at two patterned discs, one a bullseye, the other striped. Various aged babies were tested. Which of the following conclusions best suits the data presented in the graph?

A. Infants are equally interested in bullseye and striped patterns.
B. Older children tested preferred the bullseye to the striped pattern.
C. Younger children do not like the bullseye pattern.
D. Children prefer looking at patterned discs to plain coloured discs.

The next five questions refers to the diagram below.



NUMBER OF MANUFACTURING EMPLOYEES IN AUSTRALIA.

Source: Bureau of Census and Statistics.

Which statement, referring to the information in the diagram above, is correct?

A. The population of Perth is about 75 000.
B. The populations of Sydney and Melbourne are approximately equal.
C. Adelaide and the rest of New South Wales contain about the same number of manufacturing employees.
D. Brisbane will have more factories than Hobart.

42

Which of the two places mentioned have approximately equal numbers of manufacturing workers?

A. Adelaide and Sydney.
B. Hobart and the rest of Victoria.
C. Perth and the rest of South Australia.
D. Rest of Western Australia and rest of Queensland.

43

Which place would have about 150 000 manufacturing employees?

A. Perth.
B. Brisbane.
C. Melbourne.
D. Rest of New South Wales.

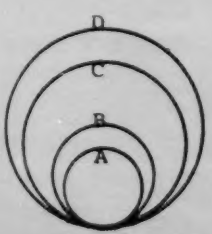
44

Where would you find the smallest number of manufacturing employees?

A. Rest of Western Australia.
B. Rest of South Australia.
C. Rest of Tasmania.
D. Hobart.

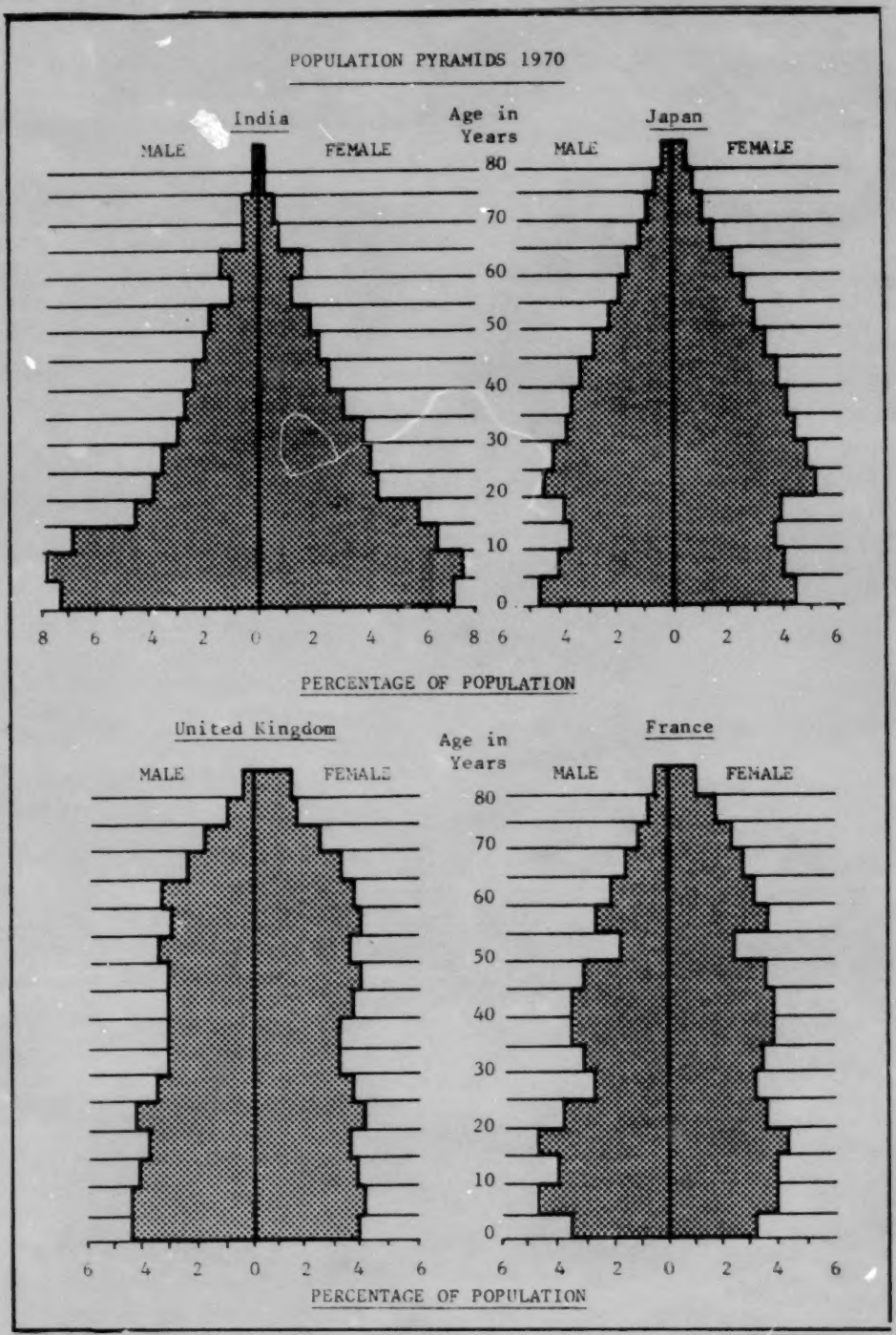
45

Which of the scale figures below would best represent a population of employees of 1 000 000?



46

The next five questions refer to the Population Pyramids below.



In France, which age group contains the lowest percentage of the population?

A. 50 - 55 males.
B. 60 - 65 males.
C. 65 - 70 males.
D. 75 - 80 females.

47

The next four questions refer to the Population Pyramids on the previous page.

Which country has the largest percentage of males in the 30 - 35 year age group?

A. India.
B. Japan.
C. United Kingdom.
D. France.

48

In which country do people tend to live longest?

A. India.
B. Japan.
C. United Kingdom.
D. France.

49

Which country has the greatest imbalance of males and females?

A. India.
B. Japan.
C. United Kingdom.
D. France.

50

Considering all countries' populations combined, which age group contains most people?

A. 0 - 5.
B. 5 - 10.
C. 10 - 15.
D. 15 - 20.

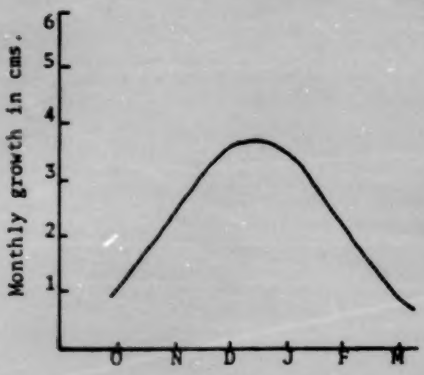
A scientist studying plant growth makes careful measurements of height once each month for six months.
The best method of displaying these results would be

A.

MONTH	GROWTH IN CMS.
October	1.2
November	2.5
December	3.6
January	3.4
February	2.1
March	0.8

B.

C.



D. "The plant grew most quickly in December and January and most slowly in October and March. 3.6 cm was the greatest growth whilst 0.8 cm was the least."

B4

52

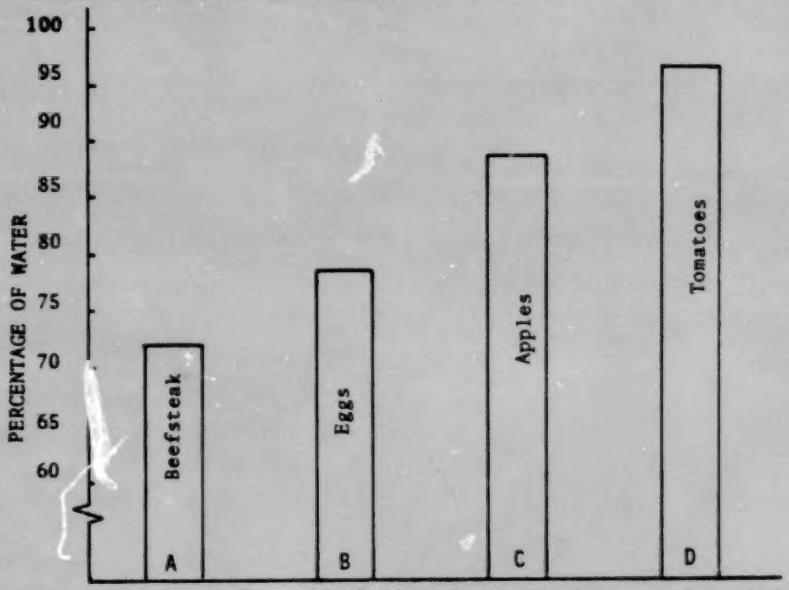
When science students perform experiments, they very often record the data in the form of a table and then plot the data as a graph. The reason why this is done is because

A. graphs are easier to draw from data set out in a table.
B. relationships are better seen graphically than numerically.
C. all laws of nature are best described graphically.
D. a graph proves that a law of nature is correct.

B3.

53

Observe the following graphs which show the relative amounts of water in common foodstuffs.



Equal weights of each of the above foods are placed in an oven and heated for 20 minutes at a temperature of 100°C. The food which would lose the greatest amount of weight would be

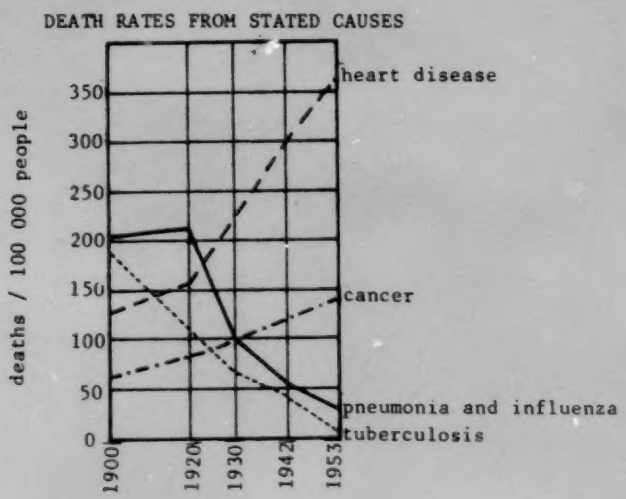
A. beefsteak.
B. eggs.
C. apples.
D. tomatoes.

D.4

54

The next five questions refer to the following graph.

A science class was discussing the death rate in Australia. They found the following graph:



From the graph we can conclude that

A. tuberculosis in 1900 caused the death of approximately 250 people in Australia.
B. tuberculosis in 1930 caused more deaths than cancer.
C. pneumonia and influenza in 1945 showed the same death rate as tuberculosis.
D. more people died in 1942 of heart disease than of cancer.

55

The graph shows that cancer killed the same number of people as were killed by pneumonia and influenza in

A. 1920 B. 1930. C. 1942. D. 1953.

56

According to the graph, which of the following caused the most deaths in 1953?

A. Cancer.
B. Heart disease.
C. Tuberculosis.
D. Pneumonia and influenza.

57

On the basis of information from the graph, deaths from pneumonia and influenza remained about the same for approximately

A. 10 years.
B. 11 years.
C. 12 years.
D. 20 years.

58

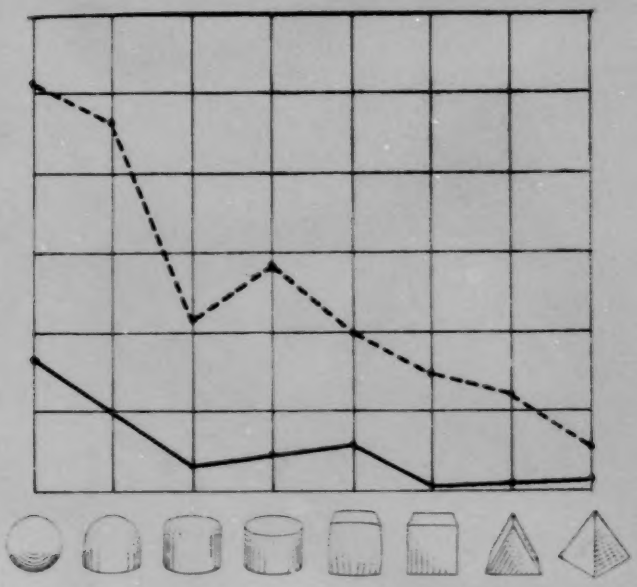
According to the graph, which of the following caused the most deaths in 1953?

A. Heart disease and tuberculosis.
B. Tuberculosis and cancer.
C. Cancer and heart disease.
D. Cancer, and pneumonia and influenza.

59

The next four questions refer to the following information.

The graph below shows the results of an experiment in which various shaped objects were set into one wall of a container holding 100 baby chickens. The number of times each object was pecked in 10 minutes (solid line) and 40 minutes (broken line) was recorded.



The total number of pecks made by the chicks in the 10 minute test is nearest

A. 310. B. 600. C. 850. D. 1400

60

The average number of pecks per chick on the round object (extreme left) in the 40 minute test is nearest

A. 3 B. 4 C. 9 D. 10

61

The average number of pecks per chick per minute for the whole 40 minute test is nearest

A. 1 B. 4 C. 10 D. 40

62

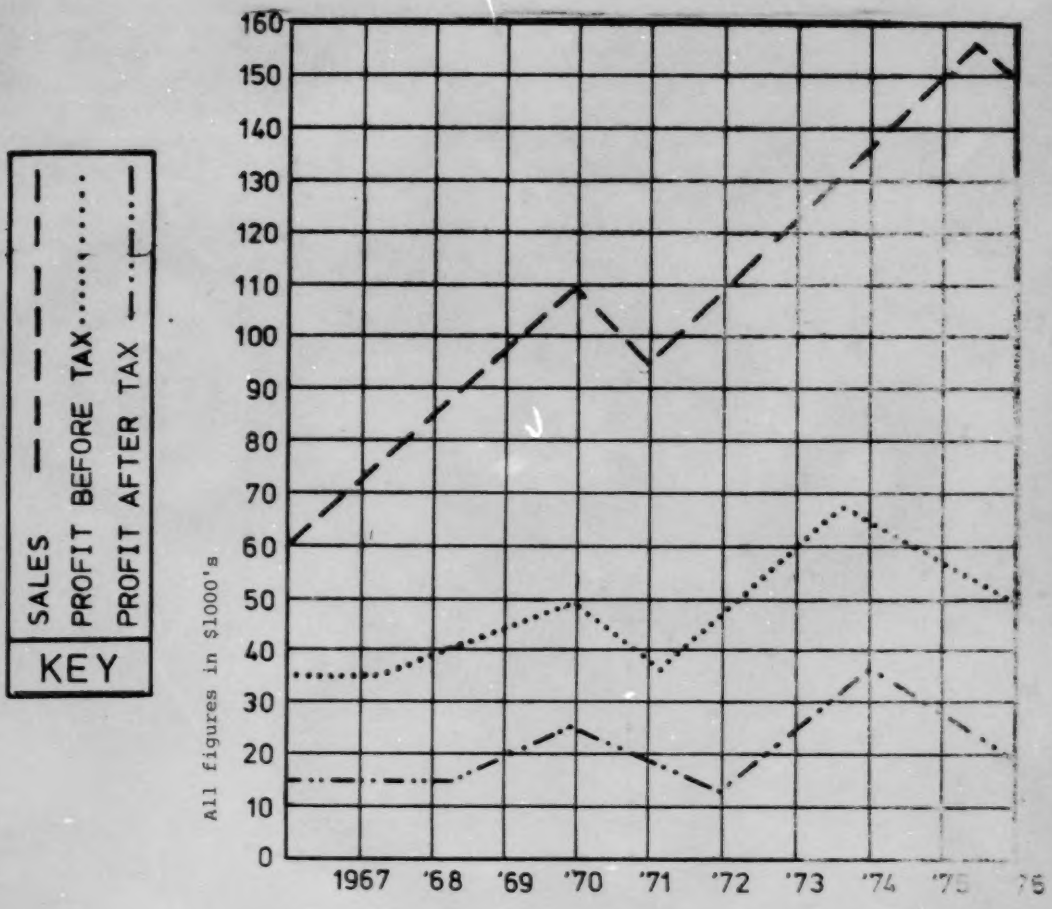
What conclusion is most justified on the basis of the results shown?

A. Objects which resemble wheat grains interest chicks more than the others.
B. Chicks show a preference for round objects.
C. Chicks do not like objects which have sharp edges or points.
D. Chicks pecked at the round objects because they looked easier to swallow.

63

The next six questions refers to this graph.

The following graph summarises the financial and trading position of a company over ten years.



How much tax was paid in 1969?

A2
A. $24 000.
B. $44 000.
C. $240 000.
D. $440 000.

64

What profit (after tax) was made from sales in 1972?

A4
A. $18
B. $48
C. $18 000
D. $48 000

65

In which year was most profit made?

C4
A. 1969
B. 1973
C. 1974
D. 1976

66

In which year was $35 000 tax paid by the company?

C2
A. 1969.
B. 1971.
C. 1973.
D. 1975.

67

68

The next two questions refer to the graph on the previous page.

Each scale division on the vertical axis carries a value of

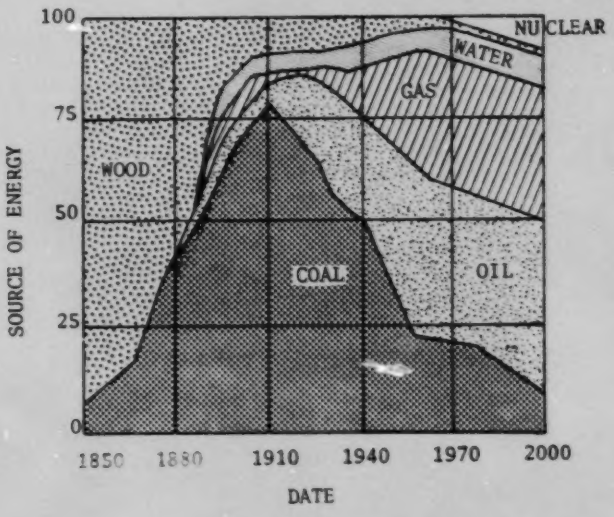
A. $10. B. $100. C. $1000. D. $10 000.

The graphs show that

A. the company has steadily expanded its sales and therefore its profit over the ten year period.
B. although sales have increased over the period, profits have steadily decreased.
C. profits over the period have decreased because people have been spending less.
D2 D. although sales have increased, profits have remained almost constant.

69

The next question refers to this diagram.



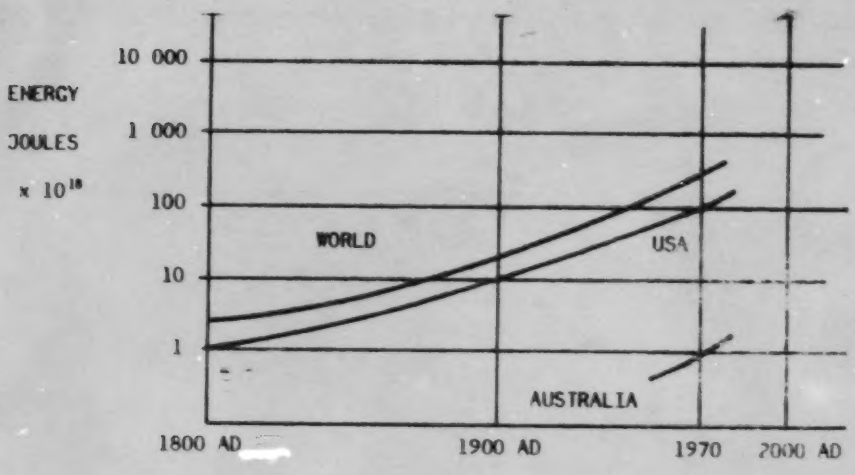
The diagram shows the % of energy used on earth as the source of the energy for the years 1850 to 2000 (predicted). The diagram shows that

A. burning wood was the only source of energy before 1850.
B. in 1940, coal supplied about 50% of the energy used.
C. nuclear energy wasn't discovered until about 1960.
D. the coal reserves of earth have been decreasing since 1910.

B2.

70

The next question refers to the graph below.



Examine the graph of energy use in the 19th and 20th centuries. If the current trend of energy use continues, then by the year 2000 AD, the world use of energy will be

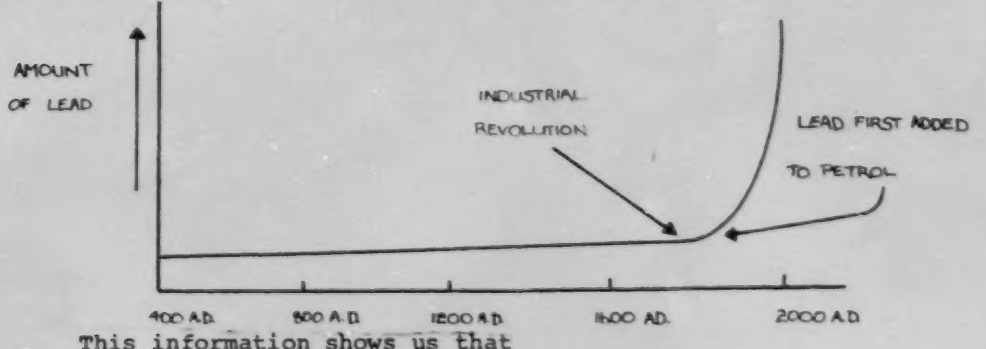
A. 100×10^{18} Joules.

B. nearly 10×10^{18} Joules.

C. more than 1000×10^{18} Joules.

C3 D. about $10\,000 \times 10^{18}$ Joules. 71

Lead has been used in the past to improve the anti-knock characteristics of petrol. Following combustion of the petrol the lead must either be retained in the engine or passed out into the atmosphere as a fine aerosol.
The following graph shows the relative amount of lead found in drill cores of snow of different ages in Greenland.



This information shows us that

A. more people are buying and using cars in Greenland.

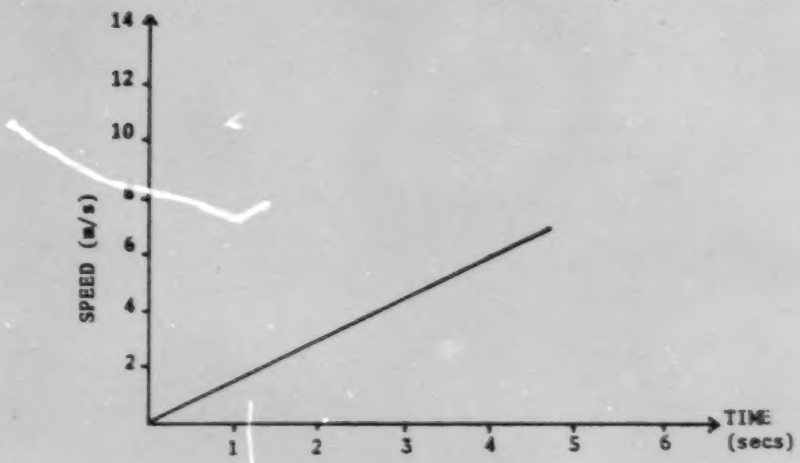
B. the spread of pollutants is much wider than was first imagined.

C. lead contamination of the atmosphere has increased markedly since its use in petrol.

D. Greenland snow is a source of lead and should be mined.

C4 72

The graph drawn below shows the relationship between the speed of a ball rolling down a hill and the time the ball has been rolling. Assume that the hill has a constant slope.

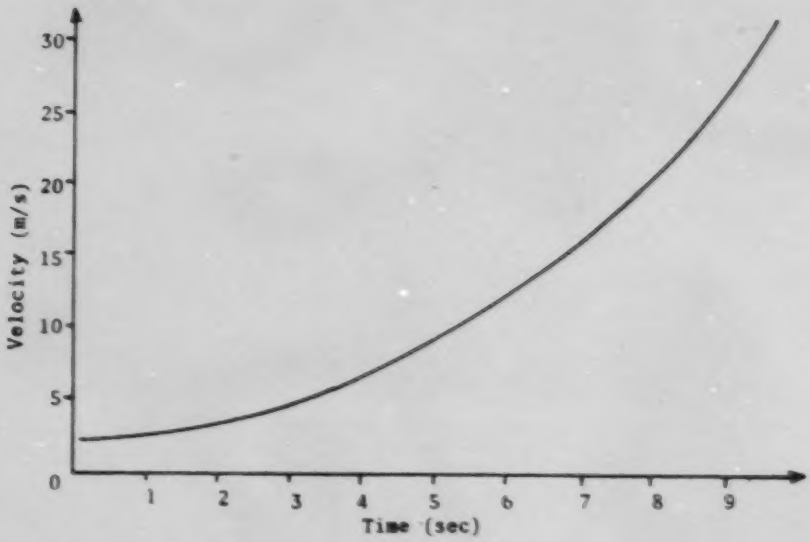


What is the most likely speed of the ball after 6 seconds if it continues to roll down the hill?

A. 7 m/s.
B. 8 m/s.
C. 9 m/s.
D. 10 m/s.

C.2

The graph below shows the motion of an object plotted against time.



How fast was the object moving, in m/s, at time 7 seconds? Approximately

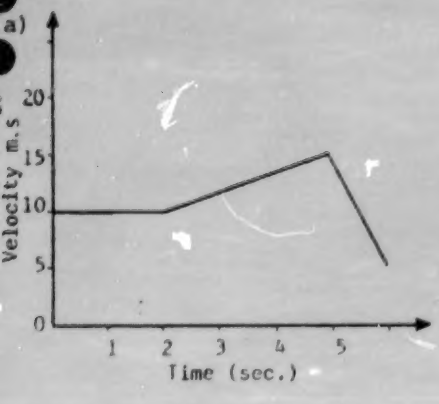
A. 3 m/s. B. 10 m/s. C. 15 m/s. D. 20 m/s.

The next question refers to this statement:

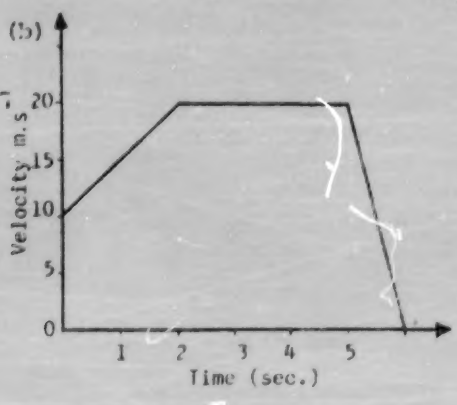
"An object starts at10m.s^{-1} and accelerates for 2 seconds. It then travels at a constant velocity for another 3 seconds, then slows down to 5 m.s^{-1}."

Which graph below shows what is described by the statement?

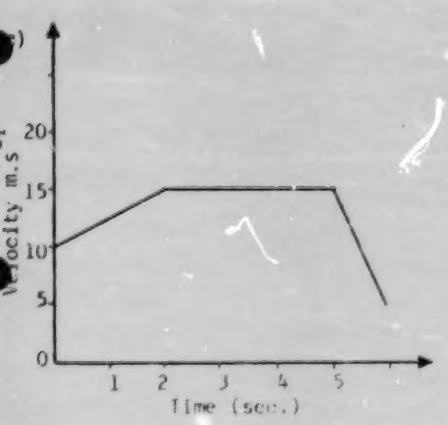
a)



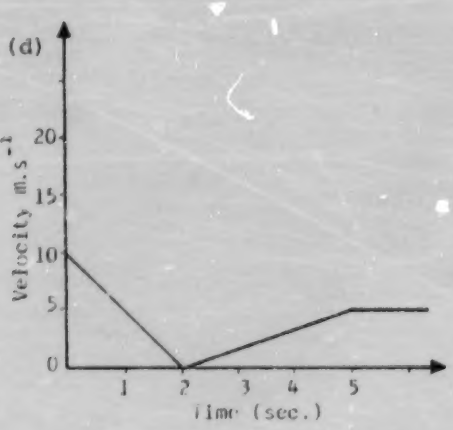
(b)



c)

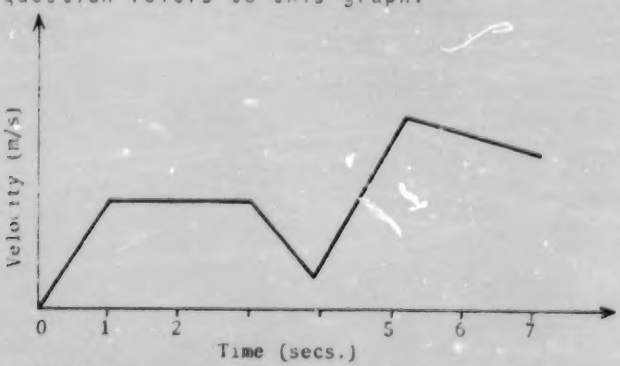


(d)



75

The next question refers to this graph.

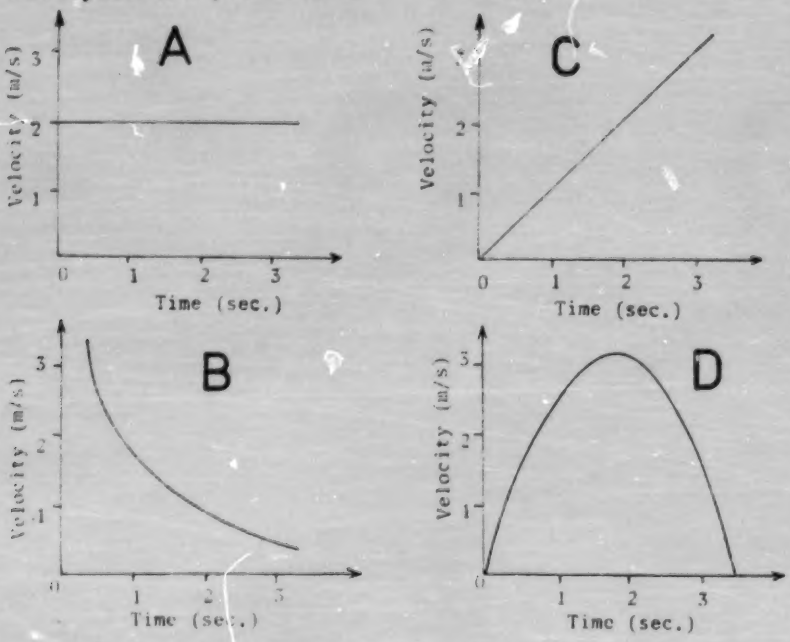


The graph shows the velocity of a car plotted against time for a short part of its journey.

During which period of time was the car travelling with constant velocity? Between

A. 0 and 1 second.
B. 1 and 3 seconds.
C. 3 and 4 seconds.
D. 5 and 7 seconds.

The graphs below show the motion of four objects of equal mass plotted against time.

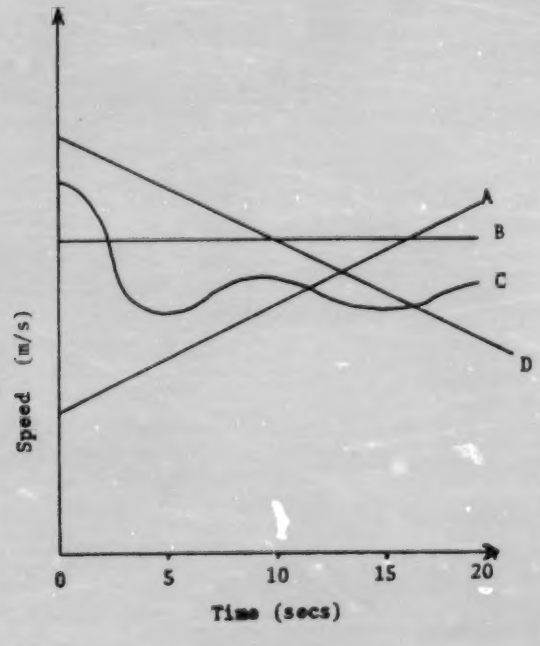


Which object has the greatest kinetic energy at time 2 seconds?

D4.

77

The next question refers to this graph.



Which object was moving fastest at time 15 seconds?

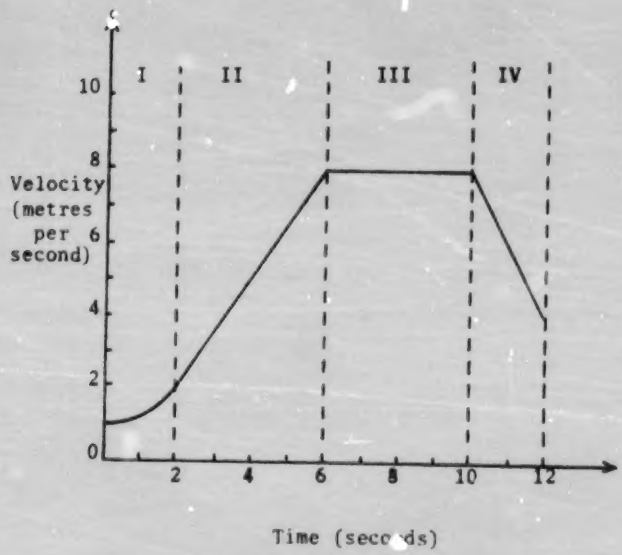
B.2

42

78

The next two questions refer to the following information.

The velocity-time graph below illustrates the motion of a body moving in a straight line.



When was the object stationary?

A. At the start of period I.
B. During period II.
C. At the end of period IV.
D. At none of these times.

D1.

79

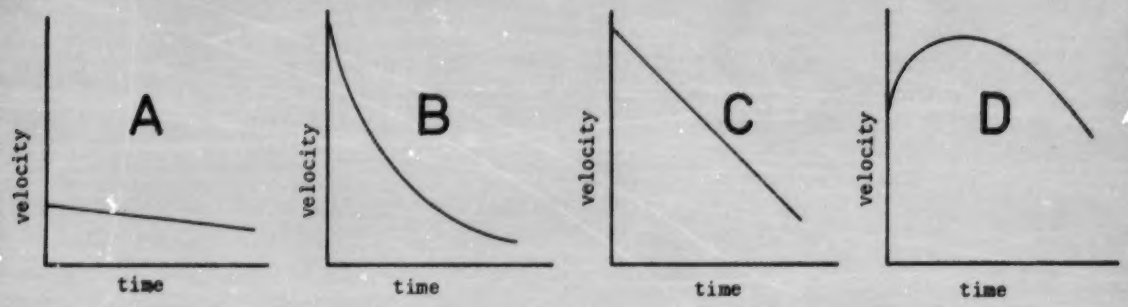
During which one of the periods I, II, III and IV, was the object travelling fastest?

A. I B. II C. III D. IV

C.1

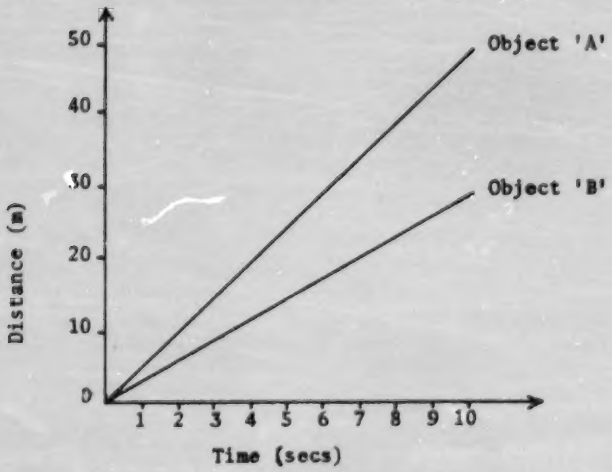
80

Consider the graphs drawn below. These show the velocities of four cars plotted against time. If the scale on each graph is the same, and each car continues with the same motion, which one will stop first?



C2. 81

Consider the following graph showing the distance travelled by two objects.



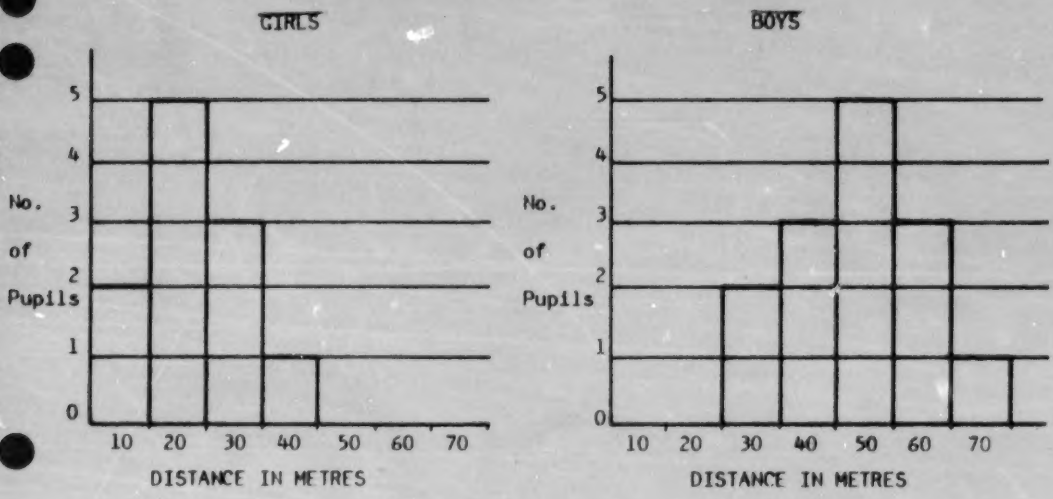
From this graph one could say that

A. after 10 seconds 'A' had travelled 20 metres further than 'B'.
B. both objects 'A' and 'B' had stopped moving after 10 seconds.
C. 'A' was climbing a steeper slope than 'B'.
D. both 'A' and 'B' started from the same point.

A.3

82

The next question refers to the two graphs below.



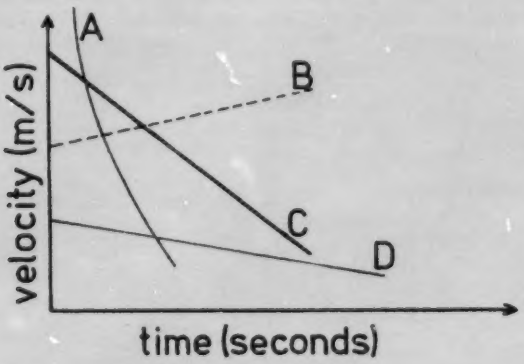
The throwing abilities of girls and boys in one year 7 class were compared and the results recorded on the bar graphs above. Which of the following conclusions would be the most justified from this information?

A. There is no difference in throwing abilities between boys and girls.
B. In this small group boys are generally better at throwing than girls.
C. All boys are better at throwing than girls.
D. Boys are stronger than girls.

B5

83

This graph shows the velocity of four cars plotted against time.

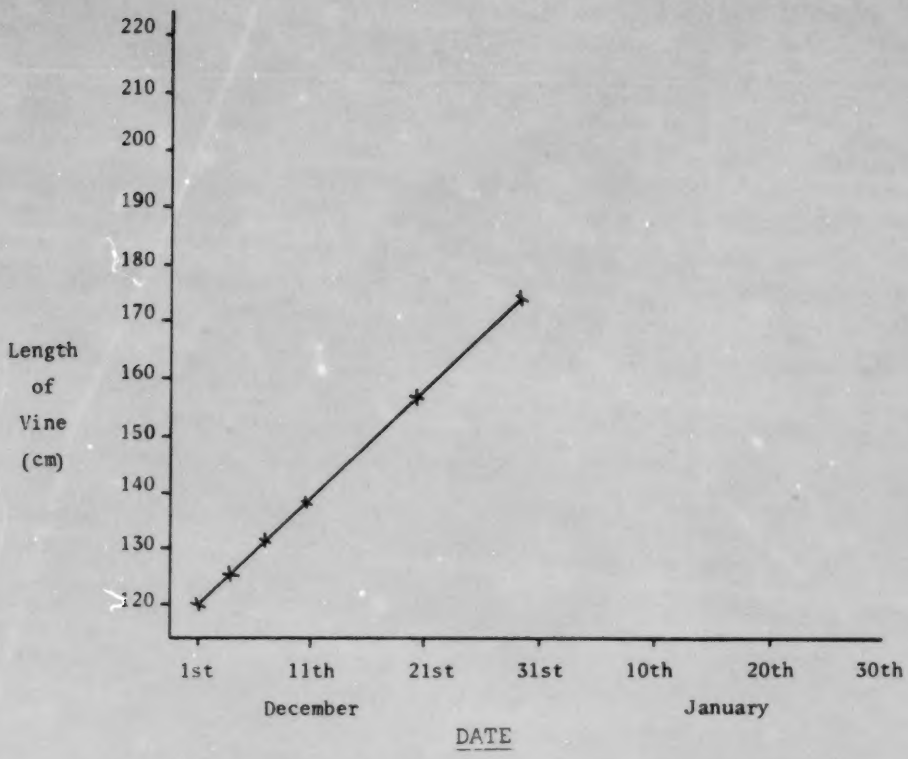


Which car is slowing down at the greatest rate?

A3.

84

A student studies the growth of a climbing plant which begins to grow in November and continues to grow at a regular rate throughout the summer. Its length is measured several times during December and the growth is plotted on the graph below.



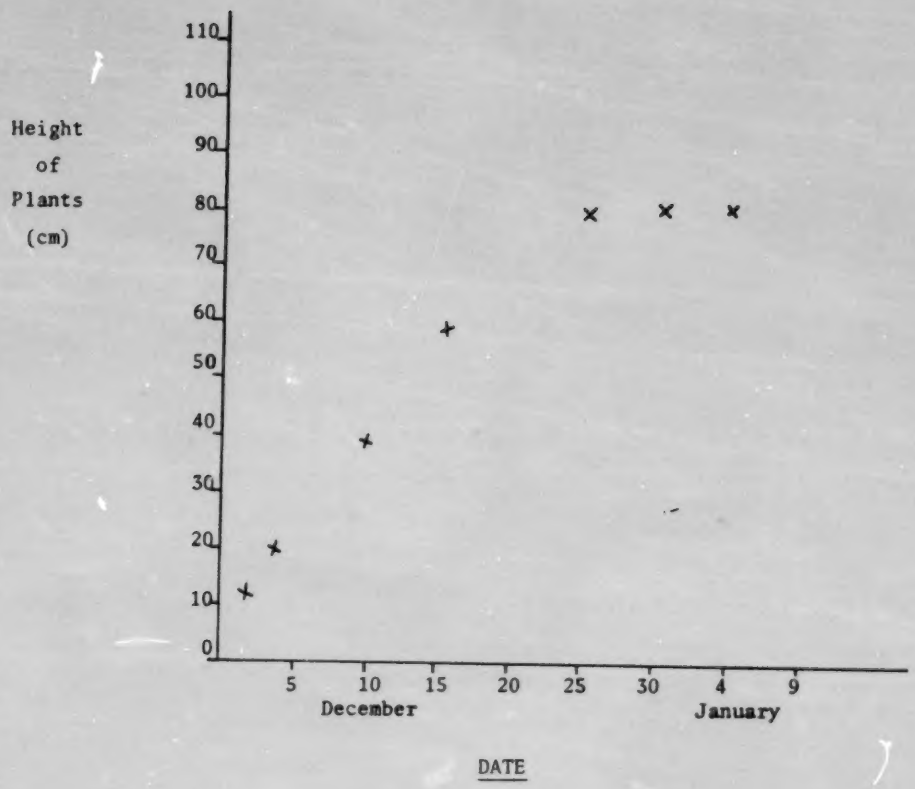
From the graph, the length of the plant on the 12th January could be predicted to be

A. impossible to estimate.
B. unknown because of uncertainty.
C. 200 centimetres.
D. 180 centimetres.

C.3

85

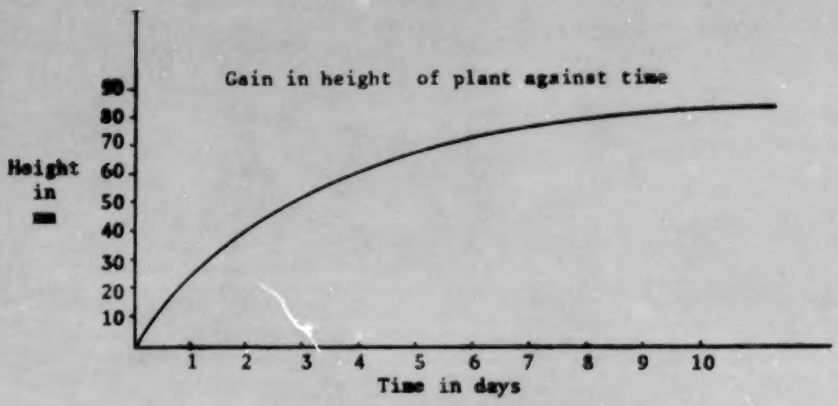
This question refers to the graph below.



An agricultural scientist in New South Wales growing tomato plants in a regularly watered garden plot measured the height of a plant at various times during its growth in December and January. These heights were plotted on the graph above. Complete the graph and answer the question below.

The height of the tomato plant on the 20th December was probably closest to

A. 20 cm.
B. 60 cm.
C. 70 cm.
D. 80 cm.



The above graph was drawn by a student after observing the growth of a plant for 10 days. From this we can say that;

A. other plants should grow the same way.
B. the growth rate of this plant gradually slowed down.
C. the growth rate of this plant gradually increased.
D. the plant grew at a constant rate.

B5. 87

A biologist studied the changes in population number for a bird species over a continuous period of two years. From his data he drew this graph:

Which of the following is a reasonable conclusion to be drawn from the graph?

A. There is a high birth rate in the population in autumn.
B. This species of bird is a migratory one.
C. The breeding season for this species is in early summer.
D. There is a high death rate in the population of this species in autumn.

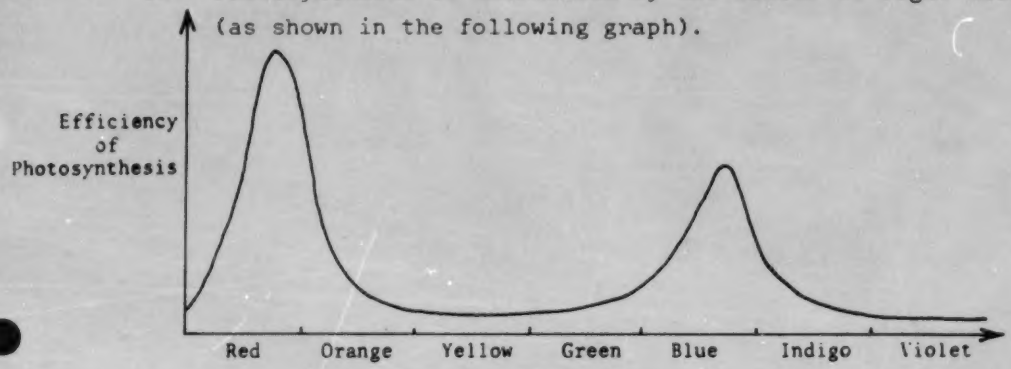
B.3

88

A scientist often uses known data to predict the result of an experiment. Read the following data:

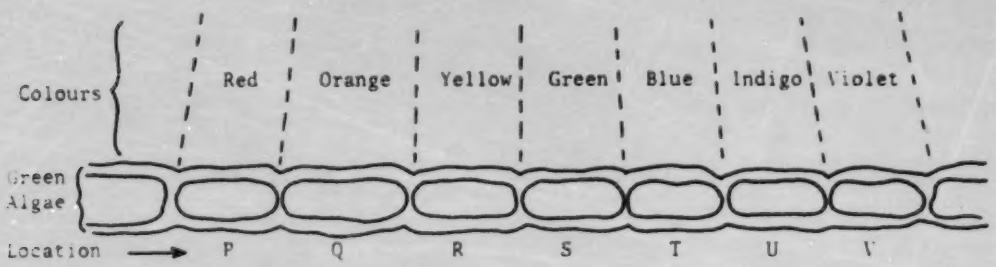
I. Green algae are able to photosynthesise and in so doing, release oxygen.

II. Photosynthesis is influenced by the colour of light used (as shown in the following graph).



III. Bacteria will accumulate around plants and concentrate their numbers wherever the plant is giving off most oxygen.

If we use a single strand of green algae cells and illuminate the strand with light of different colours, where would the scientist look with his microscope to find most of the oxygen sensitive bacteria?



A. P and T
B. Q and U
C. R and S
D. P and S

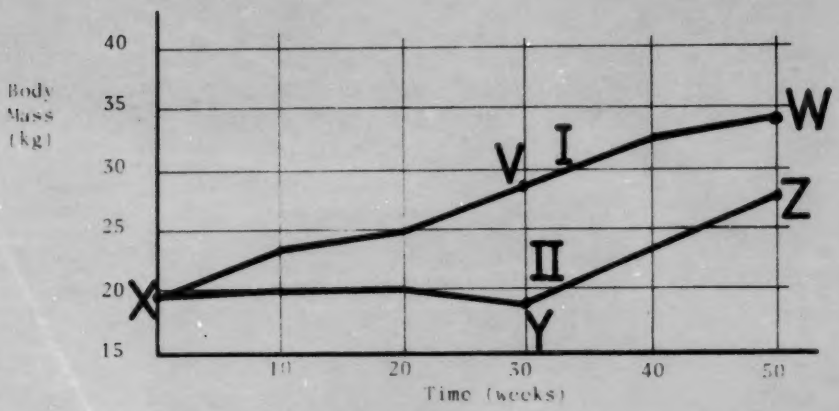
A.4

89

The next two questions refer to the following information.

Cobalt metal is required in small quantities in the diet of sheep in order that they make satisfactory gains in body weight. Where pastures do not provide sufficient cobalt, the deficiency can be corrected by inserting a small "bullet" of the metal in the sheep's stomach, where it slowly dissolves and is absorbed into the body.

The graph below shows the masses of two sheep on cobalt-deficient pasture under different supplementary feeding programmes.



Sheep I was given a cobalt "bullet" when the experiment began. Sheep II did not receive one until week 30.

The results support the hypothesis that

A. sheep with adequate cobalt in their diet increase their mass.
B. sheep lacking cobalt reach a minimum mass after 30 weeks.
C. absence of cobalt results in death of sheep within 40 weeks.
D. sheep require cobalt supplements in order to survive.

A.3

90

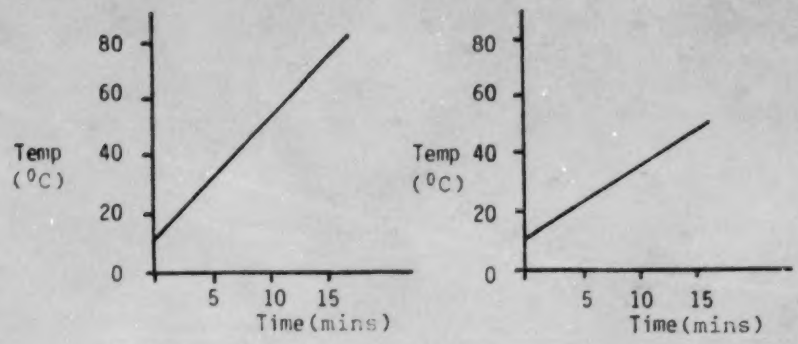
To determine the effect of the experimental variable, the scientists must examine

A. graph XVW.
B. graph XYZ.
C. graphs XV and XY.
D. graphs VW and YZ.

C.3

91

The next question refers to the following information.



A student heated two flasks containing water over identical flames. He then measured the temperature of the water at equal time intervals and drew the two graphs shown above.

From these graphs we could reasonably conclude that

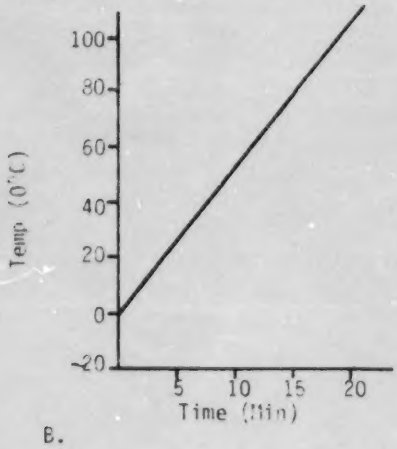
A. the water in graph I was warmer to begin with.
B. the water represented by graph II heated more rapidly than that represented by graph I.
C. graph I represents a smaller volume of water.
D. the water represented by graph I was heated for a longer period of time.

C3

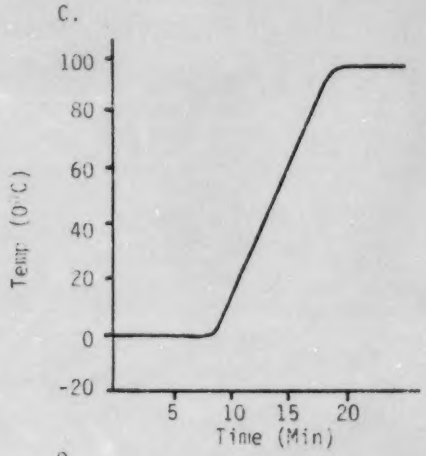
92

Which of the following graphs correctly shows the variation of temperature with time as ice is changed to steam?

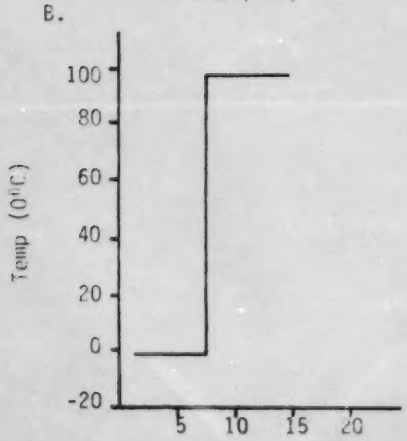
A.



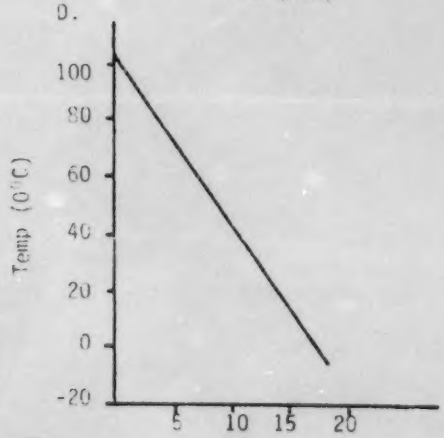
C.



B.



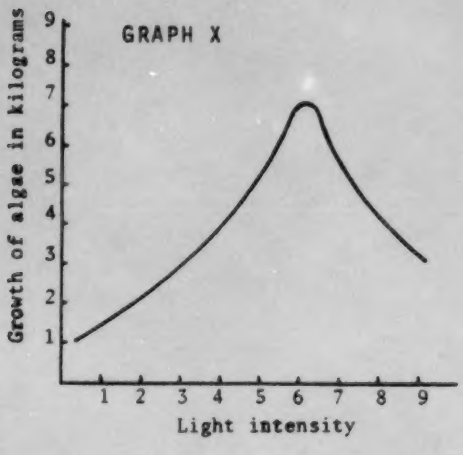
D.

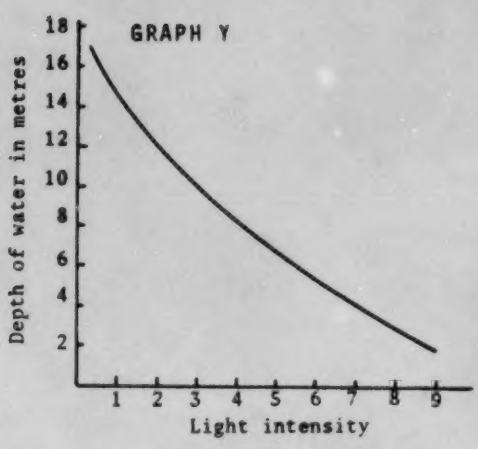


C3

93

Look at the graphs below.





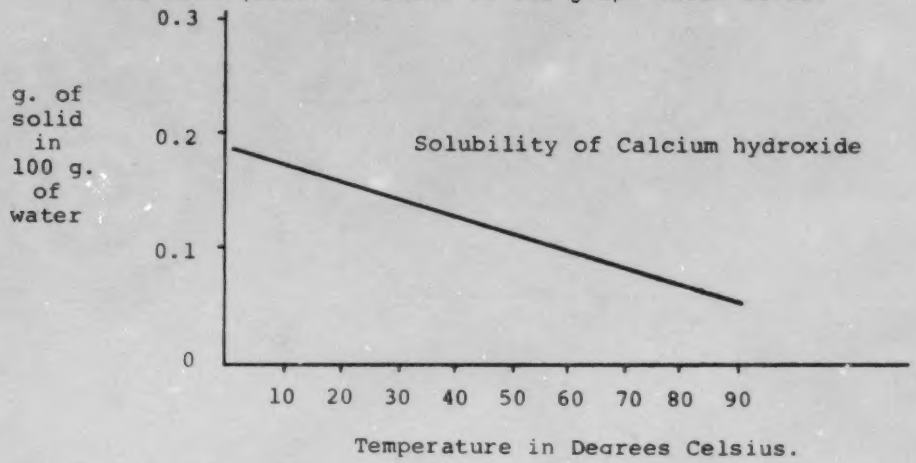
Graph X shows the amount that algae plants have grown (measured by weight) at different light intensities. Graph Y shows how light intensity changes with depth of water.

At what depth would these plants grow best?

A. 2 metres.
B. 4 metres.
C. 6 metres.
D. 8 metres.

C.2

The next question refers to the graph shown below.

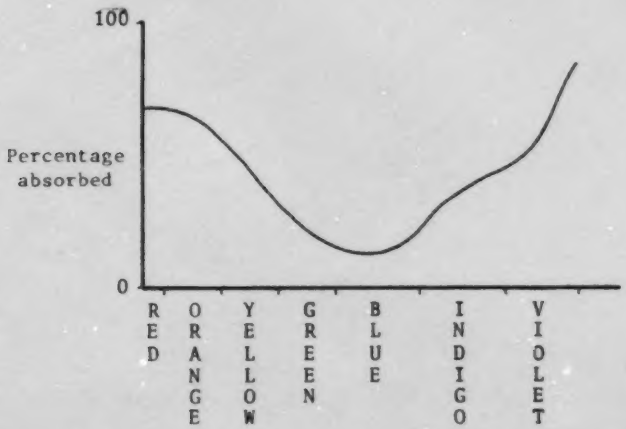


Examine the graph above. The strength of calcium hydroxide as a base in water would be greatest at

A. $0^{\circ}C$.
B. $100^{\circ}C$.
C. room temperature.
A3 D. temperatures are not important in determining the strength of a base.

95

The graph below shows the percentage of energy absorbed by coloured plastic cards when placed in sunlight.



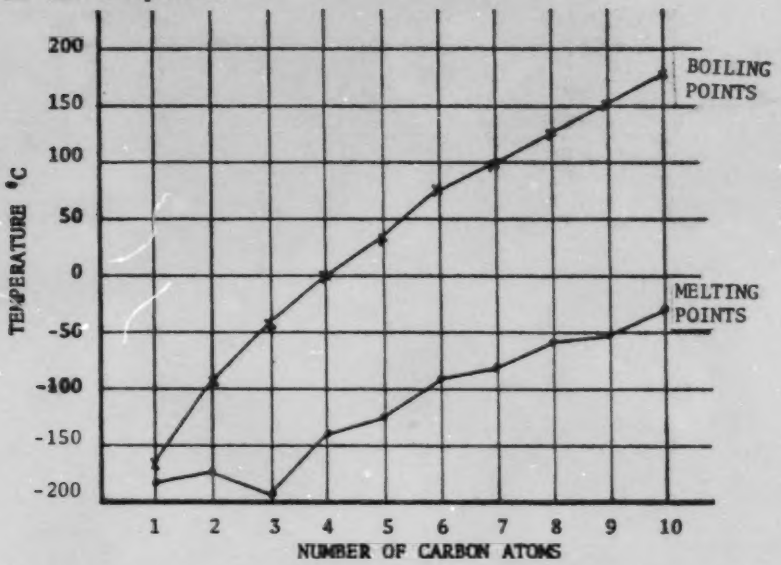
Imagine a card of each colour placed on a flat surface of snow, in bright sunlight for an hour.
Which card would sink into the snow to the greatest depth?

A. Green card.
B. Violet card.
C. All would sink to the same depth.
D. Data given do not help in answering this question.

B3.

96

The next two questions refer to this graph.
The graph shows the melting and boiling point of ten compounds, plotted against the number of carbon atoms in the compound.



Which statement concerning the compounds is correct?

A. All are liquids at room temperature.
B. Only compounds, 5, 6, 7, 8, 9 and 10 are liquids at room temperature.
C. All except compounds 1, 2 and 3 are gases at room temperature.
D. Only compound 10 is a solid at room temperature.

B2. 97

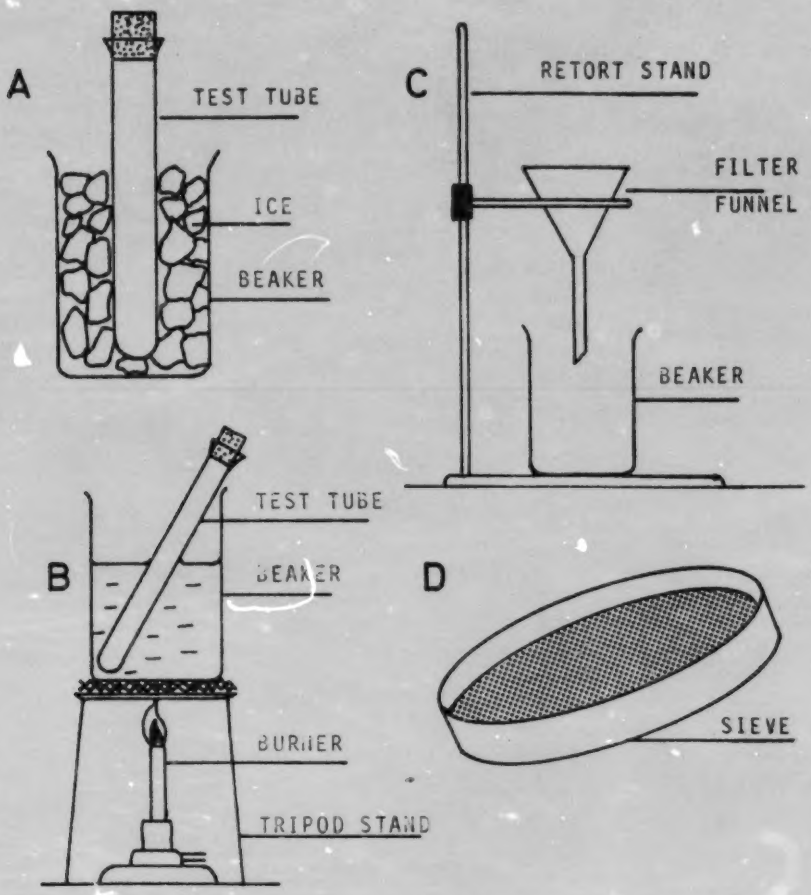
If the trend continued as shown in the graphs, then a compound with 12 carbon atoms would have M.P. and B.P. as given by

	M.P. (°C)	B.P. (°C)
A	250	-75
B	200	0
C	0	250
D	-75	200

C3. 98

SELECTING APPARATUS

If you wanted to change a substance from gas to a liquid, which of the sets of apparatus drawn below would you use?



A2

99

When heating a test-tube over a bunsen burner you should carry out all these procedures EXCEPT

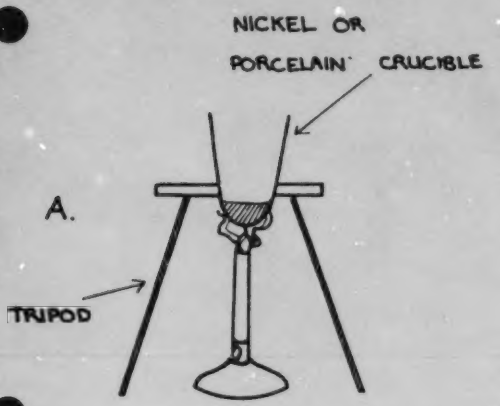
A. moving the test tube gently in the flame.
B. sloping the test tube.
C. pointing the test tube towards you.
D. keeping the contents down to about 3cm from the bottom.

C5.

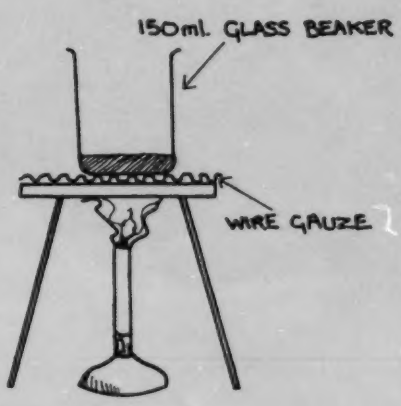
100

Which of the following pieces of apparatus would be the most suitable for melting 10 grams of sodium chloride in the laboratory?

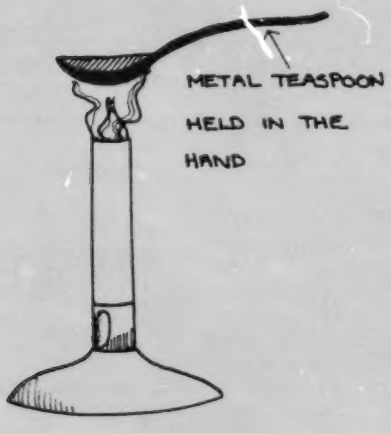
A.



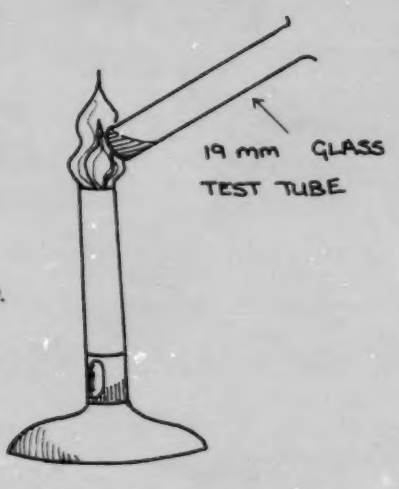
C.



B.



D.



A1.

101

A student wanted to find out from his science book how plants use oxygen.
The index read

Oxygen	Page
in air	230
and combustion	236
how fish obtain	238
molecular structure of	231
preparation of	232
in steel making	244
in respiration	237

On which page is he likely to find his answer?

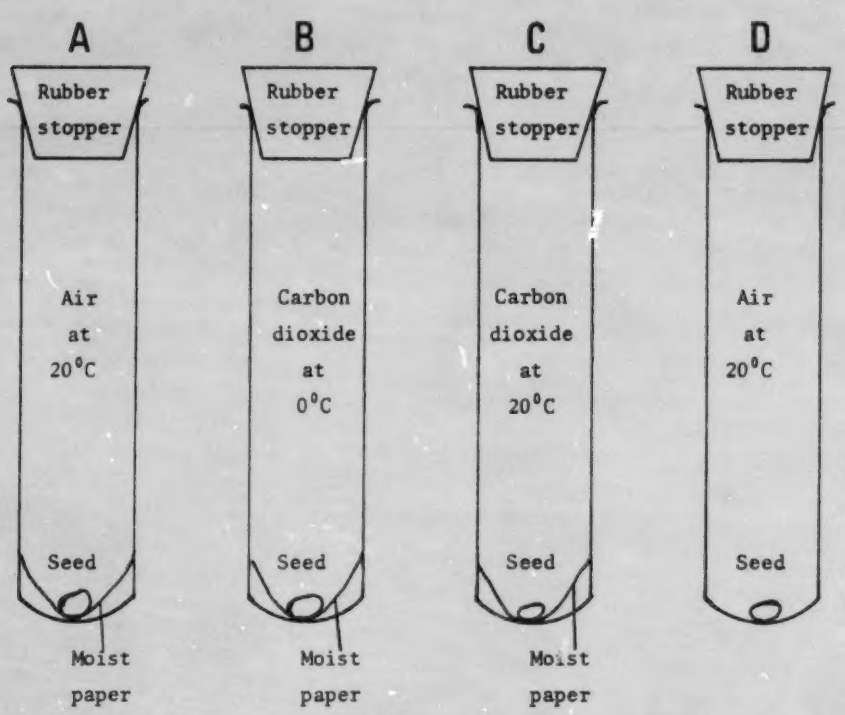
D4 A. 230. B. 238 C. 236 D. 237

102

A textbook states that the conditions needed for seeds to start growing are

(i) a suitable temperature.
(ii) the presence of water.
(iii) the presence of oxygen.

If the above information is correct, in which of the following sets of apparatus would the seeds start growing?



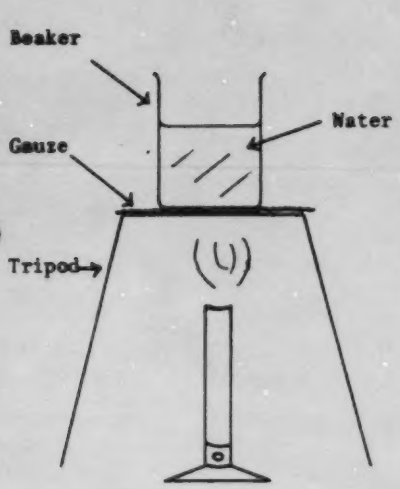
103

A field excursion to study the earth history of the local area is to be undertaken by a class of science students. Which of the following kits of equipment would be the most useful to take on such an excursion?

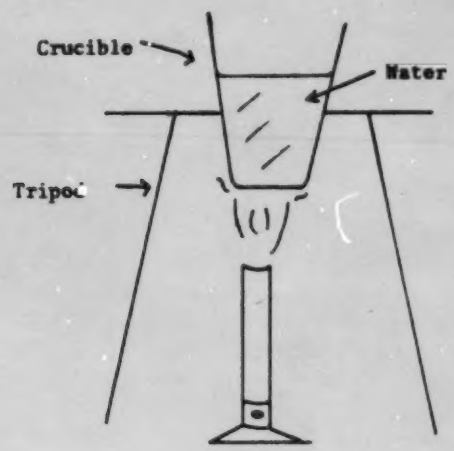
A. First aid kit, hands lens, glass slides and cover slips, scalpel and scissors.
B. Rock pick, rack of test tubes, weak alkali solution, litmus paper.
C. Topographic map, compass, metric rule, thermometer.
D. Hand lens, rock pick, compass, topographic Map.

104

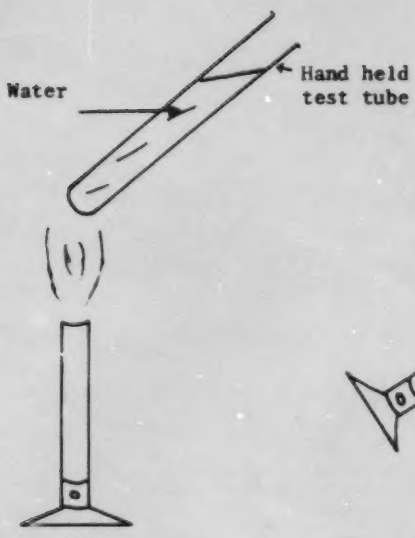
A student wishes to boil some water in the laboratory using standard laboratory equipment. Which of the following diagrams illustrates the most suitable method for doing this:



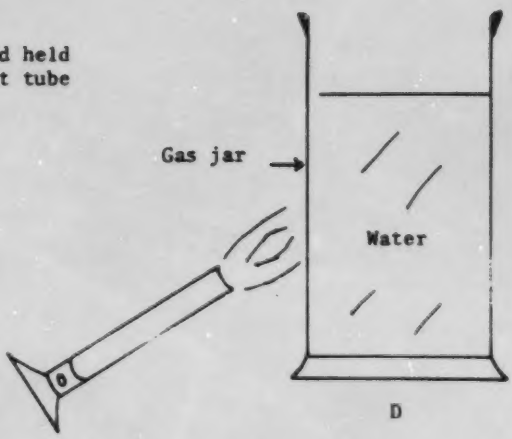
A



C



B



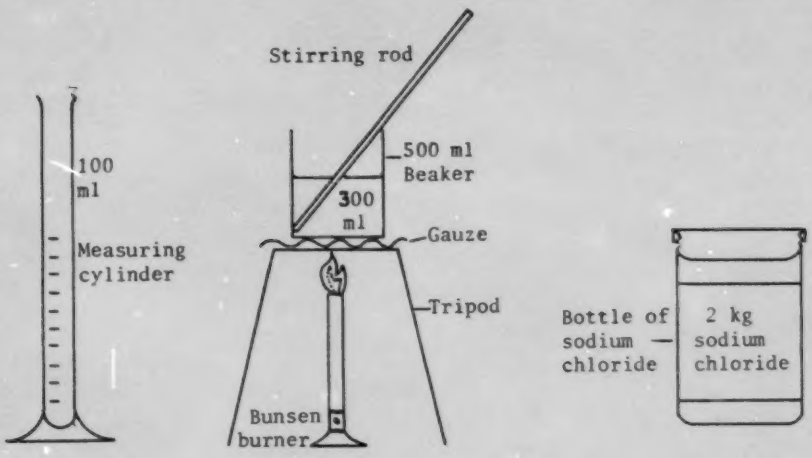
D

An experiment carries the following instructions:

"Heat 300 ml of water in a beaker and dissolve 5.0 g of sodium chloride".

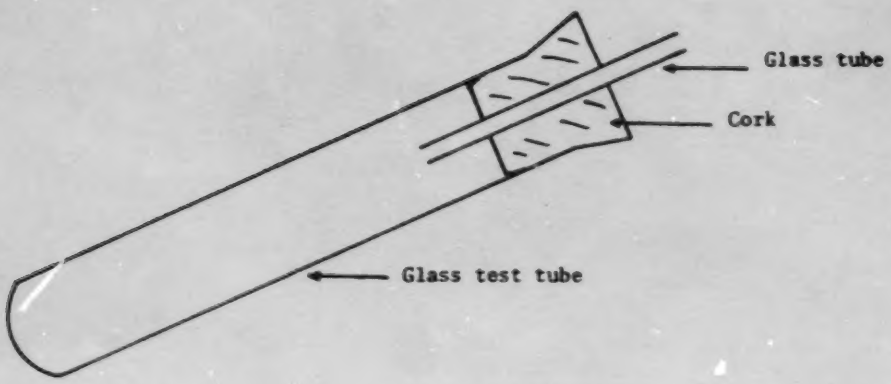
The diagram below shows some of the apparatus a student could use to do this. One essential piece of apparatus is missing from the diagram. The essential piece of apparatus is

A. crucible tongs.
B. chemical balance.
C. filter paper.
D. boiling chips.



B3.

A student wishes to make up the apparatus in the diagram below.



Before he starts he will need to collect some equipment to do the job. Which of the following groups of equipment will enable him to perform his task?

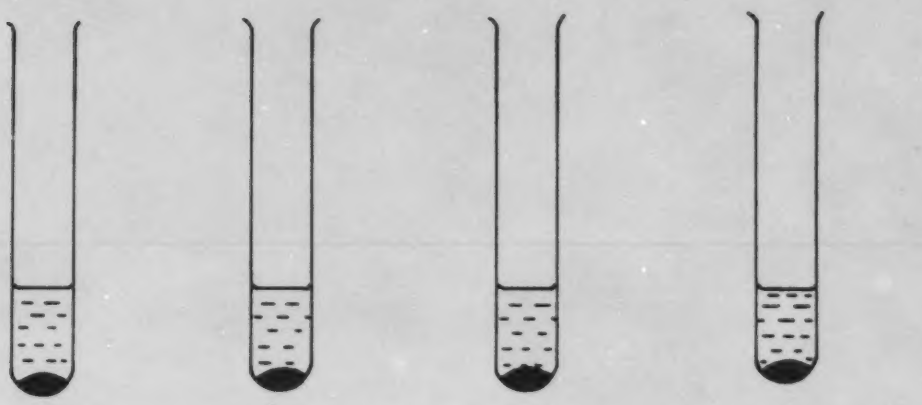
A. glass tube, cork, test tube, pliers, drill.
B. glass tube, cork, test tube, file, cork borers.
C. glass tube, cork, test tube, bunsen burner, blow pipe.
D. glass tube, cork, pliers, bunsen burner, cork borers.

B3.

107

METHOD

An experiment was conducted to test the rate of solution of sugar in water under different conditions. Equal quantities of sugar were added to equal volumes of water in the test tubes A, B, C and D. The test tubes were then treated as follows:

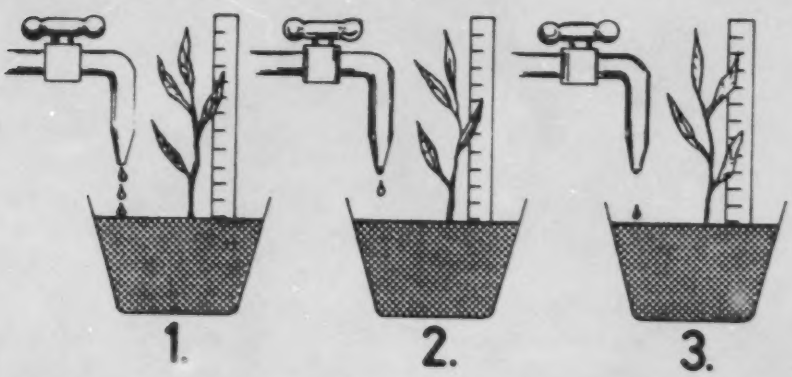


Which test tube could be used as an experimental control?

A3.

A student wanted to find out if the amount of water supplied to a plant affects the rate at which it grows.

He set up three containers as shown. The tap above each one can regulate the rate at which the drops of water are supplied to each container.

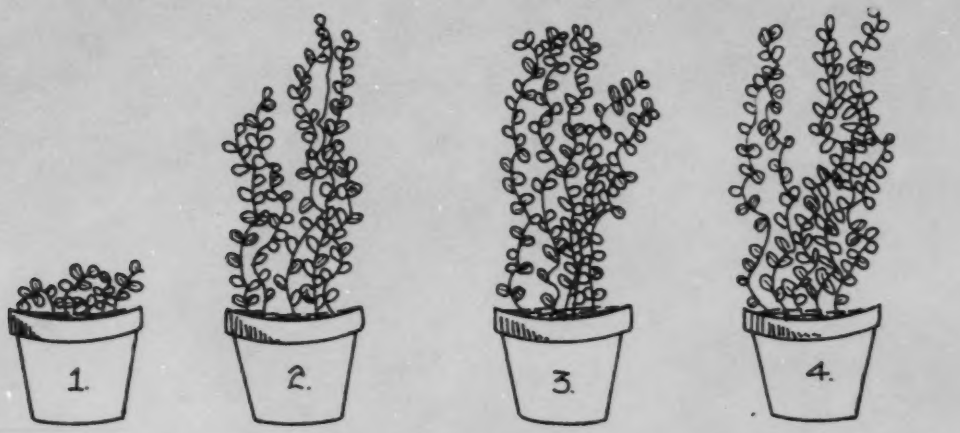


The experiment would NOT be spoiled if

A. different types of seedlings were used in the three containers.
B. the temperature in the room changed during the experiment.
C. one container was kept in the dark and the other two were placed in the sunlight.
D. each seedling was fed a different type of fertiliser.

B3

The next three questions refer to this diagram.



Which container(s) act as controls for this experiment?

A. 1 only.
B. 1 and 3.
C. 3 and 4.
D. 2 and 4.

B3 110

Which containers need to be observed to notice the results of this experiment?

A. 1 and 4.
B. 1, 2 and 4.
C. 2, 3 and 4.
D. 1, 2, 3 and 4.

B3 111

Which conclusion could best be drawn from these results?

A. The additon of chemical "X" causes dwarfism in plants.
B. The addition of chemical "X" causes dwarfism in pea plants.
C. The addition of chemical "X" only affects dwarf pea plants.
D. The addition of chemical "X" can affect the height of pea plants.

C3 112

In testing whether the presence of carbon dioxide hastened the conversion of iron to rust, a test tube was set up containing air, iron, water and carbon dioxide.

As a control we should set up a test tube containing iron, water and

A. no air.
B. an inert gas.
C. no carbon dioxide.
D. twice as much carbon dioxide.

C3. 64 113

A geologist wishes to know which of a number of rock types is most suitable to be used in the construction of a building. He takes samples of a number of rocks, weighs them and exposes them to high and low temperatures for several weeks. He notices that the surface flakes off some of the rocks and measures the percentage loss in weight for each rock.

For this test to be reliable it would be necessary for the samples to be

A. of the same weight.
B. from the same locality.
C. of the same shape and size.
D. of the same rock type.

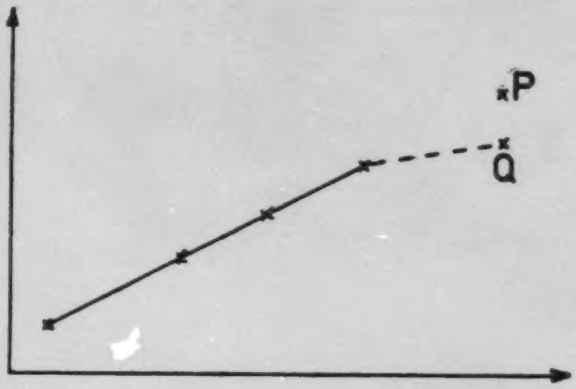
C1. 114

A scientist believes that dogs may not like the cold. To test his idea he should study what happens when he

A. puts a dog in a cold room.
B. lets several dogs choose between hot and cold rooms.
C. puts several dogs in a cold room.
D. lets a dog choose between a hot and cold room.

B3. 115

A student obtained the following graphical results from an experiment (shown by the unbroken line).



On the basis of the results he expected his next reading to be in the region of point "P".
However, his experiment result, falling at point "Q", did not support his prediction.
What would you do if you obtained a similar result in an experiment you were doing?

A. Repeat the experimental run which gave point Q as a result.
B. Connect the graph points as shown by the dotted lines.
C. Disregard point Q, draw the graph so as to pass through P which is the more logical and correct result.
D. Check the previous readings to determine whether or not they are correct.

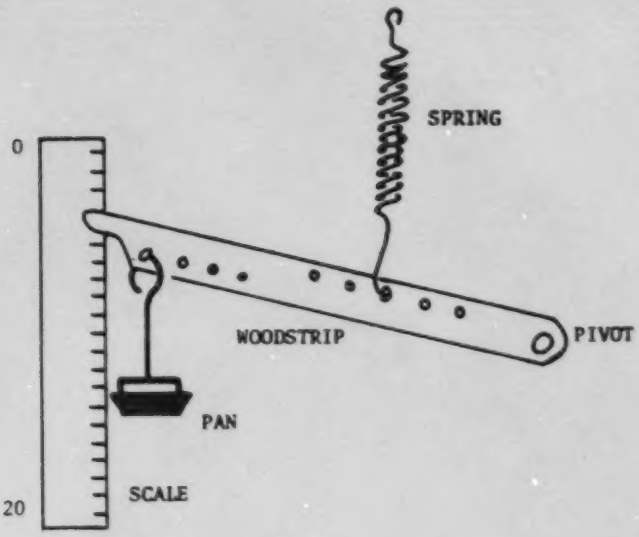
A.2 116

A candle is very simple to make. First, melt some wax and then pour into a mould containing a wick and leave it to solidify. When people first try to make candles they usually have a fair degree of success. However, only people who make many candles produce really excellent ones every time. This clearly demonstrates the value of

A. careful study.
B. experimentation.
C. experience in skills.
D. scientific investigation. 117

The diagram shown below relates to this question.

In the experiment shown, similar-sized masses are loaded one by one on to the pan and as the wooden strip moves down, the reading on the scale is noted.



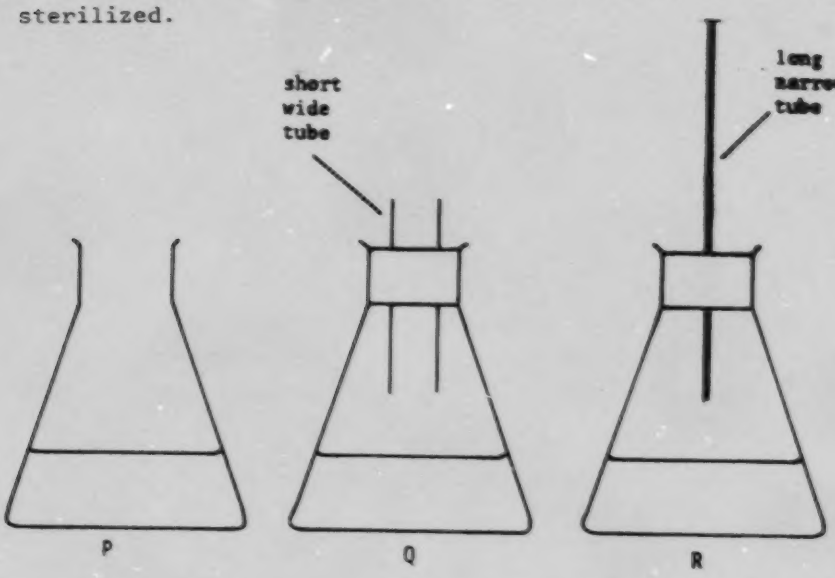
Here is one set of results:

No. of Masses on Pan	Reading on Scale
1	3
2	5
4	8
5	10
6	19

Since the last result appears wrong the student, in writing up his report, should

A. leave out the last result as it does not conform to the pattern of the others.
B. report all the results, noting that the last was unexpected.
C. alter the last result so that it conforms to the general pattern.
D. alter the last result only after checking with other group results.

A scientist made up a broth using some cubes of meat extract. He sterilized the broth by heating in a pressure cooker for 20 minutes. He placed some of the broth in each of three flasks as shown below. The flasks and tubing had also been sterilized.



After a few days he noticed that the broth in flasks P and Q had become cloudy and had started to smell, it had 'gone bad'. The most likely reason for this was that

A. spores of bacteria were present in P and Q but not in R when the experiment was set up.
B. air cannot enter R so that the decay bacteria could not grow.
C. bacteria cannot grow in sterilized broth made from meat cubes.
D. spores of bacteria can enter flasks P and Q more easily than R.

D.5

To reduce the possibility of errors affecting the results of experiments, scientists try to

A. observe as carefully as possible.
B. repeat the experiment several times.
C. do the experiment under controlled conditions.
D. do all of the above.

D4.

The following table shows the *colour* of litmus in various solutions:

TYPE OF LITMUS	SOLUTION		
	ACID	ALKALI	NEUTRAL
RED	*Red*	*Blue*	*Red*
BLUE	*Red*	*Blue*	*Blue*

A student places a piece of blue litmus paper in a colourless liquid and finds that the paper maintains its blue colour. He concludes, from this evidence alone that the solution is alkaline.

Which of the following statements is correct?

A. The student has made an accurate deduction and needs no additional evidence.
B. He should test the solution with a piece of red litmus before drawing conclusions.
C. He should repeat the experiment with another piece of blue litmus paper before drawing conclusions.
D. His conclusion is correct since only acids would change the colour of the blue litmus.

B3. 121

Some students were asked to determine the volume of a cube of sugar. They suggested two ways of doing this as follows:

Method 1: Place the cube in a measuring cylinder of water to determine how much water is displaced (pushed up). The water displaced would be equal to the volume of the cube.

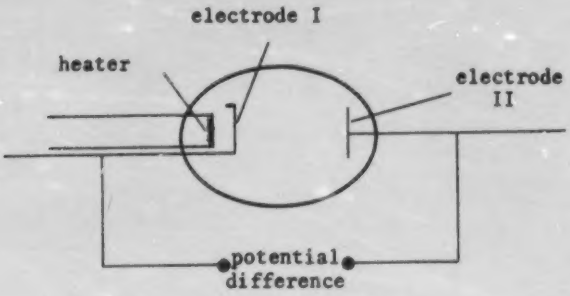
Method 2: Measure the sides of the cube and calculate the volume (i.e. volume = length x breadth x height).

After further discussion they decided not to pursue Method 1 but decided to use Method 2. The most likely reason for their choice would be that:

A. Method 2 is not so messy and would be easier to do compared with Method 1.
B. one of sugar's properties makes Method 1 unlikely.
C. measuring cylinders are never very accurate.
D. air trapped in the sugar cube would give rise to an inaccurate measurement using Method 1.

B.2 69 122

A thermionic diode is an electronic device consisting of two electrodes, one of which can be heated, housed in an evacuated glass tube, as represented in the diagram below. When operating in an electric circuit electrons can be made to travel from the heated electrode (I) to the other (II). For this electron flow to occur it is necessary to maintain a potential difference between the two electrodes.



A thermionic diode

If no current is observed to flow through the diode when it is connected to the potential difference, which one of the following procedures should be first carried out?

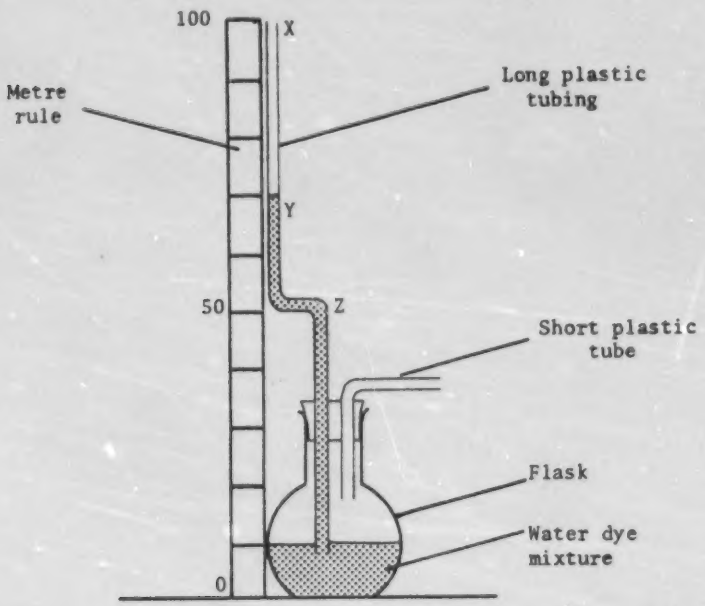
A. Cool electrode II so as to increase the difference in temperature between the two electrodes.
B. Check that the wires are connected to the appropriate terminals of the circuit element supplying the potential difference.
C. Move the electrodes closer together, but not touching.
D. Allow a small amount of air into the tube, but keep the internal pressure below atmospheric pressure.

A green-coloured blob of jelly-like material has been found on a beach. To decide if it is a plant, the best thing to do would be to

A. prod it to see if it responds to touch.
B. call it a plant because it is green.
C. use a microscope to look at its cells.
D. cut off a piece and see if it grows.

The next 3 questions refer to the following information.

The diagram below represents apparatus used in an experiment designed to measure the maximum pressure exerted by a person's breath. The person blows into the short plastic tube as hard as he can, forcing fluid from the flask into the long plastic tubing as shown in the diagram. The maximum breath pressure is measured by the difference between the level of liquid in the flask and the level in the tube.



To answer the questions assume that the above diagram depicts the measurement of the maximum breath pressure of a particular person.

To read the level in the long plastic tubing the experimenter should position his eyes

A. as close to the short plastic tube as possible.
B. in position X.
C. in position Y.
D. in position Z.

The diagram indicates that the person has a maximum breath pressure of

A. 50 cm of liquid.
B. 60 cm of liquid.
C. 70 cm of liquid.
D. 100 cm of liquid.

B.1 126

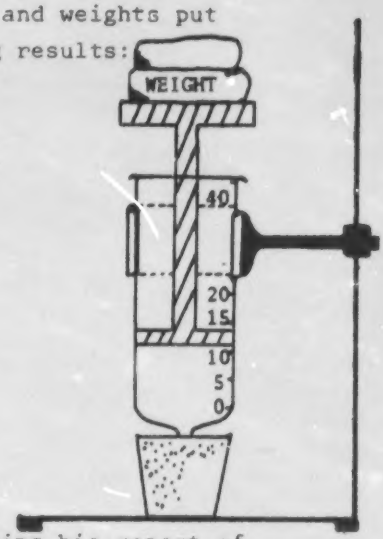
If a person is found to have a maximum breath pressure well below the average for his age, he is most likely suffering from a disease of the

A. heart.
B. lungs.
C. liver.
D. kidneys.

B.4 127

A gas was enclosed in a syringe as shown and weights put on top. A student obtained the following results:

Number of Weights	Volume of Gas in syringe (mls)
1	21
2	20
3	18
4	17
5	14
6	2

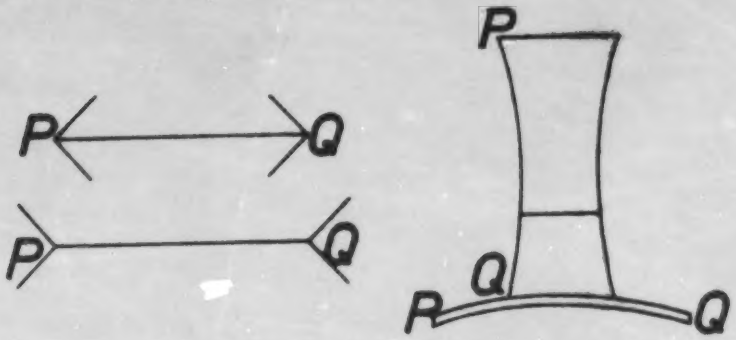


The last result appears wrong. When writing his report of the experiment, the student should

A. report all results, noting that the last result is unexpected.
B. leave out the last result as it spoils the experiment.
C. alter the last result, using other results as a guide to what the volume should be.
D. ask others what results they got and then change the last result.

A.4 128

The next question refers to the diagrams



The lines marked PQ in all of the above diagrams are the same length in spite of the fact that you do not see them to be so. These and other optical illusions are deceiving because -

A. the same length line in different positions appears as different lengths on the retina of the eye.

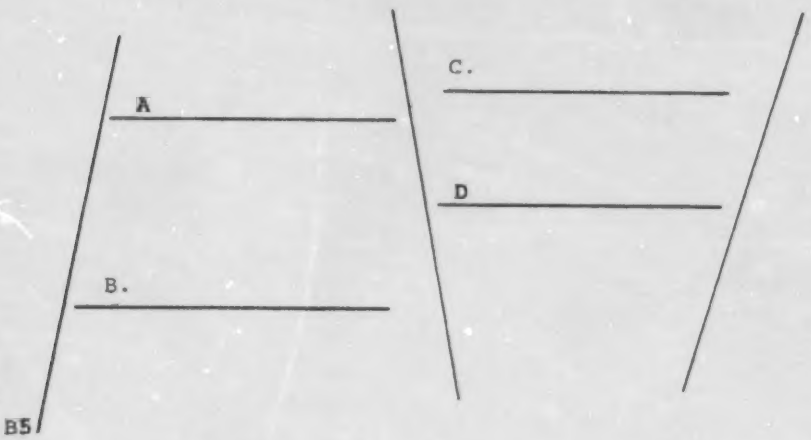
B. the presence of extra lines in the diagrams upsets the brain's interpretation of the image on the retina.

C. the apparent difference is due to poor judgement and they would appear the same if one practiced more.

D. they are just party tricks and have no scientific importance at all.

B3. 129

Which line below (A, B, C or D) is the longest?



B5 130

ANALYSIS OF RESULTS

The next three questions refer to the following information.

An inventor has developed an instrument to measure the 'heteroeasibility' of various substances placed in a funnel on top of the instrument. On the front of the instrument are the following:

(i) a meter which registers the 'heteroeasibility' (scale reading 0 to 20);

(ii) a meter which records the value of property *W* (scale reading 0 to 10);

(iii) a meter which records the value of property *X* (scale reading 0 to 10);

(iv) a meter which records the value of property *Y* (scale reading 0 to 10);

(v) a globe which lights up if property *Z* is present in the substance.

The instrument is pictured below.

Corresponding readings obtained for a number of substances are listed below:

Heteroeasibility (*H*)	*W*	*X*	*Y*	*Z*
20	10	10	0	present
15	10	10	5	present
0	10	10	0	absent
0	10	10	5	absent
5	5	10	10	present
0	5	10	10	absent
5	0	10	5	present
0	5	5	10	present
0	0	10	5	absent

The next three questions on this page refer to the information on the previous page.

If Z is absent, which of the following relationships is consistent with the information in the table?

A. $H = 0$
B. $H = W + X - Y$
C. $H = 2X - 2Y$
D. none of the above.

A.2 131

If Z is present, which of the following relationships is consistent with the information in the table?

A. $H = 2W - Y$
B. $H = W + X + Y$
C. $H = W + X - Y$
D. none of the above.

C.1 132

In answering this question, assume that the relationships established above apply for all readings of H, W, X, Y and Z.
When $W = 6$, $X = 4$, $Y = 3$, and Z is present, H is

A. 0 B. 7 C. 9 D. 13

B.2 133

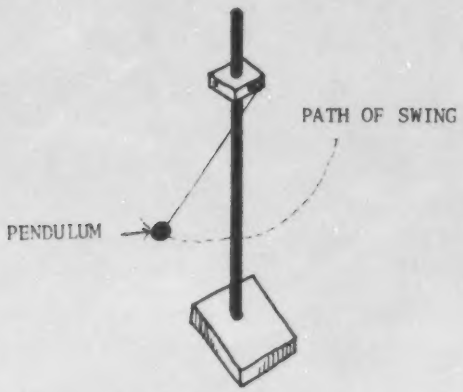
Four pairs of students carry out an investigation into the effects of exercise on pulse rate. The procedures they follow are set out in the table below:

PAIR	NAME	PROCEDURES
A	Joan Mary	Both late for class. Hurry to places. Run on spot for two minutes. Take each other's pulse.
B	John Bill	Runs on spot for two minutes. Takes John's pulse rate after the two minutes.
C	Cathy Helen	Takes Helen's pulse rate, while Helen is still seated. Runs on spot for two minutes. Then has her pulse rate taken by Cathy.
D	Jim Tony	Runs around courtyard for two minutes. Takes own pulse rate. Sits at bench in laboratory and takes own pulse rate.

Which pair would obtain the most useful information about pulse rates?

C3. 134

The next question refers to this diagram.



The diagram above illustrates a pendulum set up for an experiment. The pendulum was allowed to swing and the number of full swings occurring in each minute was recorded. The string was then shortened and the observations repeated. The results are shown in this table:

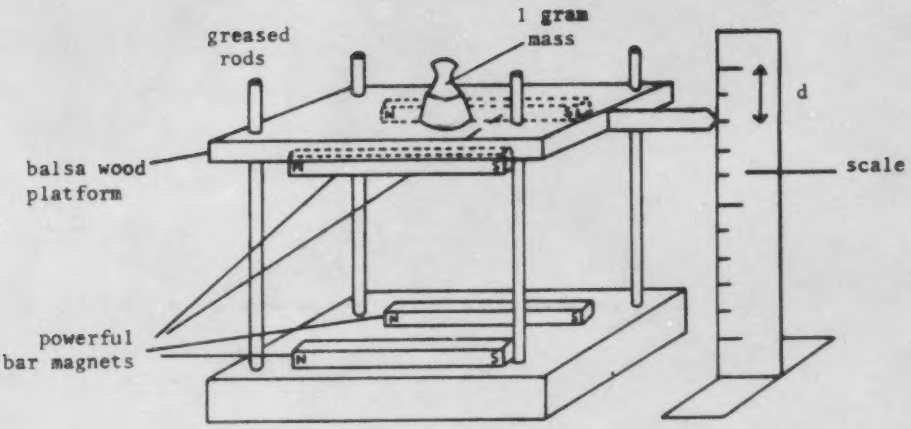
String Length	Number of full swings / minute			
	Trial 1	Trial 2	Trial 3	Average
Long string	46	48	47	47
Short string	64	62	63	63

If you were to shorten the string length still further, which of the following sets of results A, B, C or D would you expect to get?

	Trial 1	Trial 2	Trial 3	Average
A.	30	28	32	30
B.	80	78	76	78
C.	46	48	47	47
D.	30	50	70	50

B4.

135



A student builds a "repulsive" balance shown above, using four bar magnets. Before he can use the balance he calibrates the scale by placing 1, 3, 5 and 7g masses on the platform and recording the measurement "d" on the scale. He repeats this several times and his results are shown below.

Mass	1st reading	2nd reading	3rd reading
1g	2.0	2.1	1.9
3g	4.2	4.2	4.1
5g	4.8	4.9	4.6
7g	5.2	5.3	5.2

These results show:

A. that more masses should be used for calibration to increase the accuracy of the balance.

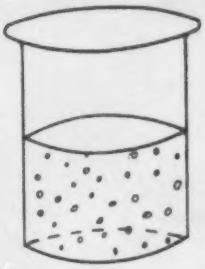
B. that only masses less than 1g can be used on the balance.

C. that the mass of the platform must be known before the balance is used.

D. that the balance cannot be calibrated because "d" does not vary regularly with the mass on the platform.

Students were asked to look at a beaker of clear liquid from which bubbles of gas were seen rising. They set up the following hypothesis to explain what was going on inside the beaker.

HYPOTHESIS: The liquid is decomposing and giving off a gas.



The students carried out four tests to see if their hypothesis was correct. The tests are listed below.

	TEST	RESULT
A.	Measure temperature of the liquid.	50^0C
B.	Warm up to 70^0C	Bubbles appear faster.
C.	Analyse the bubbles to identify them.	The bubbles are oxygen.
D.	Boils for a few minutes and then remove the bunsen.	The bubbles still form.

137

D1

Which of the above results best supports the students' hypothesis?

MAKING CONCLUSIONS

The next five questions refer to the following information.

In 1793, the Italian scientist Spallanzani investigated the problem of how bats find their way into dark caves. As a result of his experiments, he found that

1) normal bats can avoid collisions while flying;
2) normal bats utter frequent high pitched cries while flying;
3) blind bats can avoid collisions while flying;
4) bats with their ears plugged do not avoid collisions;
5) bats prevented from making sounds do not avoid collisions while flying.

For the next five questions answer:

A - if the statement is justified in terms of the experimental observations;
B - if the statement goes beyond these experimental observations;
C - if the statement is contrary to the experimental observations;
D - if the statement is explaining bat behaviour as if they were human.

USE ONLY THE INFORMATION GIVEN ABOVE

B1 Bats navigate by interpreting echoes. 138

B3 Bats can distinguish one object from another by the way it reflects the high-pitched sound back to them. 139

C Bats find navigation difficult in the dark. 140

B2 Animals with poor eyesight make up for it by having a highly developed sense of hearing. 141

B3 Many bats get caught in electricity wires because the wires are too thin to send an accurate echo back to the bat. 142

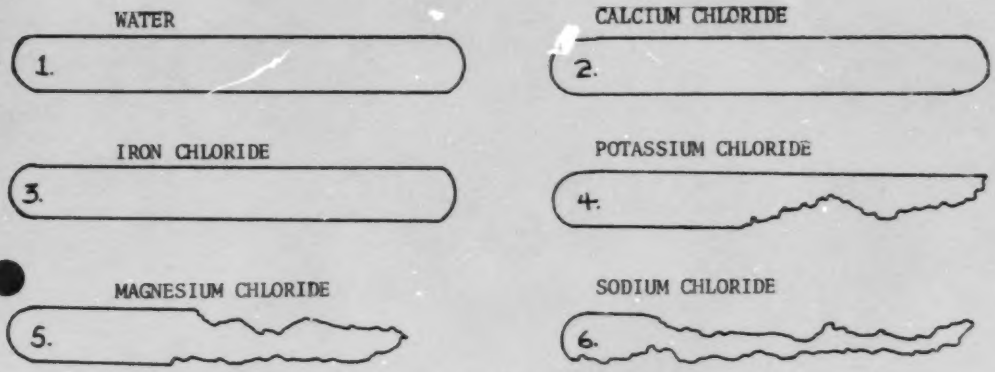
Many refrigerators have vegetable storage at or near the bottom of the refrigerator. Mary thought this was the best place to store vegetables but wanted to try an experiment to prove it. She would obtain the best evidence by

A. placing equal amounts of water in similar containers on each shelf and comparing their evaporation rates.
B. placing samples of the same kind of vegetable on each shelf and observing what happens to them.
C. taking temperature readings on each shelf and comparing them.

B5 D. placing an ice cube in a dish on each shelf and observing which one lasts longest. 143

The next three questions refer to the following information and diagram.

Five identical wooden sticks were soaked in solutions of different chemical compounds, and a sixth was soaked in water. After soaking, these wooden sticks were left in a paddock for two days to see if rabbits would eat any of the sticks.
After the experiment, the sticks looked like this



What conclusion below could best be drawn from this?

A. Rabbits are more deficient in chemicals 4, 5, 6.
B. Rabbits did not like chemicals 1, 2, 3.
C. Chemicals 5, 6 are important in a rabbit's diet.
D1 D. Rabbits would probably seek chemical 6 in nature.

44

Why might this experiment be invalid?

A. There is no certainty that the sticks have been nibbled by rabbits.
B. The experiment has not been controlled by including an unsoaked stick.
C. The sticks should have been left in the paddock longer.
A1 D. More chemicals need to be used to find out about rabbits eating habits.

45

Which step below would be most likely to make the experiment more valid?

A. Put a fence around the paddock to keep other animals out.
B. Leave the sticks in the paddock for a longer period of time.
C. Use more sticks, with more chemicals, and a control.
D1 D. Conduct the experiment in a laboratory.

46

The next three questions refer to the following information.

Alcohol accounts for more serious road accidents in Australia than all other causes combined.
To test the effect of alcohol on drivers, researchers carried out tests on 500 heavy drinkers and 500 non-drinkers. They tested drivers' reactions to emergency situations at various blood alcohol levels. The results are shown below:

HEAVY DRINKERS

ALCOHOL BLOOD LEVEL	AVERAGE NUMBER OF MISTAKES
0.00%	3.6
0.05%	5.7
0.08%	13.1
0.10%	21.2

NON-DRINKERS

ALCOHOL BLOOD LEVEL	AVERAGE NUMBER OF MISTAKES
0.00%	3.5
0.05%	5.8
0.08%	13.2
0.10%	20.9

From the results the researchers could conclude

A. alcohol has no effect on the reactions of drivers.
B. alcohol has similar effects on the driving ability of heavy drinkers and non-drinkers.
C. the legal blood alcohol level should be raised to 0.10%.
D. non-drinkers made no mistakes when there is no alcohol in their blood stream.

B.4 147

The reason for carrying out the driving test with a blood alcohol level of 0.00% is to

A. show that only drinkers should be allowed to drive.
B. show that drivers who don't drink don't make any mistakes.
C. have a control with which to compare the various blood alcohol levels.
D. demonstrate that alcohol doesn't matter because everyone makes mistakes.

C.3 148

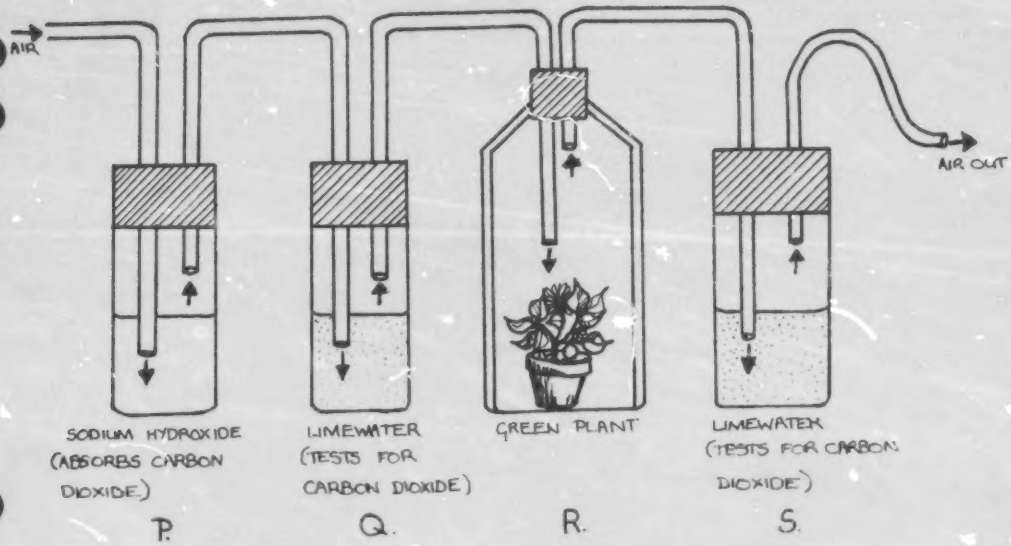
The reason for having such large groups in the experiment was to

A. remove the chances of errors.
B. show that everyone is different and so a single legal blood alcohol limit is unsatisfactory.
C. have people with all sorts of drinking habits tested.
D. make sure that people who drove every type of car were represented in the test.

A.1 149

The next question refers to this diagram.

This experiment tests whether green plants make carbon dioxide.



During the experiment it was noticed that the limewater in container Q remained clear, while the limewater in container S turned milky.

Which conclusion is best drawn from these results?

A. Sodium hydroxide absorbs carbon dioxide.
B. Sodium hydroxide does not absorb carbon dioxide completely.
C. The green plant produces more carbon dioxide than the sodium hydroxide can absorb.
D. The green plant produces some carbon dioxide.

D3. 150

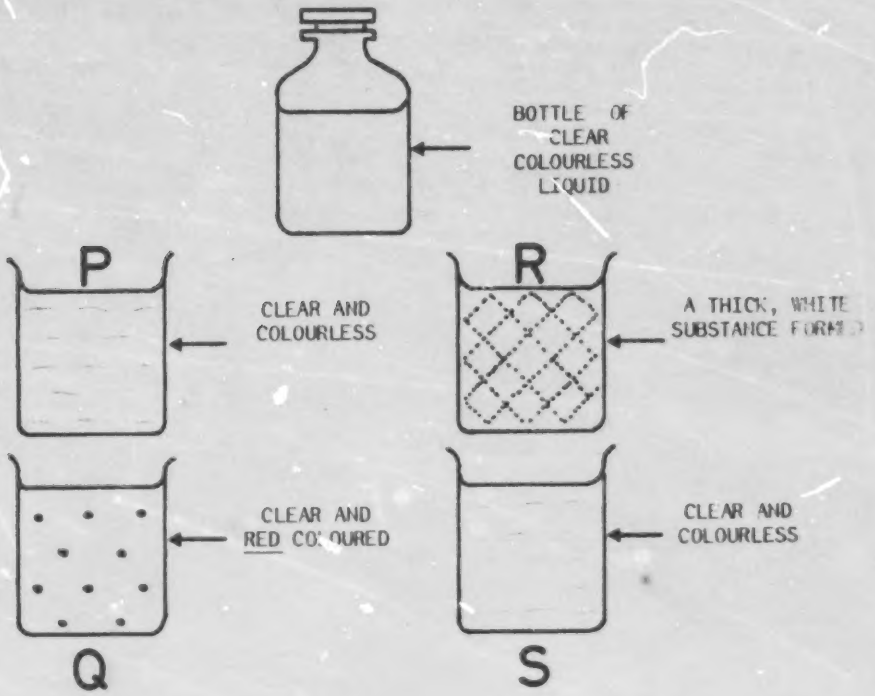
If carbon dioxide is bubbled through limewater a white substance forms. Up to a certain point the more carbon dioxide used the whiter the limewater becomes. When air is bubbled through the limewater for a short time a faint milky appearance results. When a person breathes out into limewater for the same length of time a strong milky appearance results. The best conclusion one could draw from this experiment is

A. the air we breathe out contains carbon dioxide.
B. the air we breathe in contains carbon dioxide.
C. we breathe out more carbon dioxide than we breathe in.
D. we breathe in more carbon dioxide than we breathe out.

151

C.2

The four beakers and the bottle shown below contained clear, colourless liquids. A student added an equal volume of the liquid in the bottle to each of the beakers. He observed the following results.



Which of the following statements is correct?

A. P and S both contained water only.
B. P and S contained the same liquid.
C. R was the only beaker in which a chemical reaction occurred.
D2 D. New substances were formed in Q and R. 152

A student tried two experiments and made these observations.

EXPERIMENT X

When he added sodium chloride crystals to water he observed that they dissolved, leaving the liquid clear.

EXPERIMENT Y

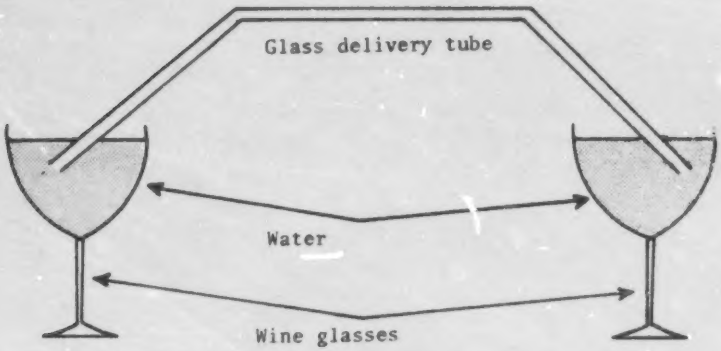
When he put a piece of shiny sodium metal in water he observed a violent reaction which consumed the sodium and produced a colourless gas.

After thinking about his observations he concluded that a chemical change had taken place in both experiments.

We can say that his conclusion is

A. correct because new substances were formed in each experiment.
B. correct because in both experiments he observed a change of phase.
C. incorrect because a new substance was produced only in Experiment Y.
C1 D. incorrect because in Experiment X the substance added was already a compound. 153

The following simple apparatus was used by Cavendish in one of his experiments.



He placed air and oxygen in the bent delivery tube and subjected it to electric sparks. The water rose in the tube to almost completely fill it.

Knowing that -

a) Oxygen + Nitrogen → Nitrogen dioxide
b) Electrical sparks will cause oxygen and nitrogen to combine.
c) Nitrogen dioxide is soluble in water.

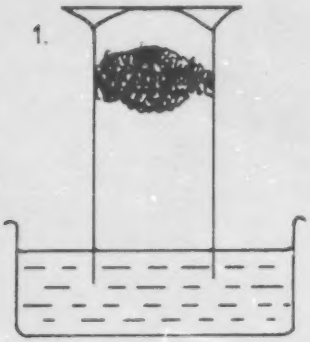
Which of the following conclusions could Cavendish best make from his observations?

A. Air is made up almost entirely of oxygen and some other gas which react with each other to form another gas which is soluble in water.
B. Oxygen will combine with some part of the air when subjected to a spark to produce a gas which is soluble in water.
C. Oxygen will combine with some part of the air to form a gas which exerts a pressure and causes the water to rise in a tube.
D. Electric sparks cause all gases to combine.

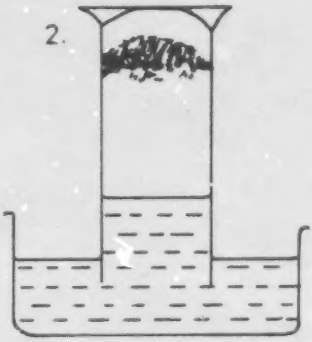
The following experiment was carried out in a school laboratory.

Steel wool was placed into a gas jar which was placed over water (diagram 1). After two weeks it was noted that the steel wool had rusted and that the water level had risen in the gas jar (diagram 2).

1.

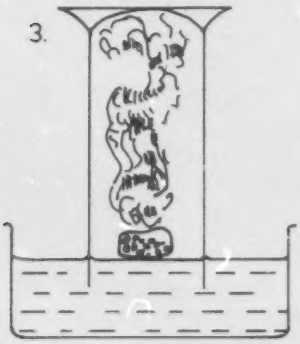


2.

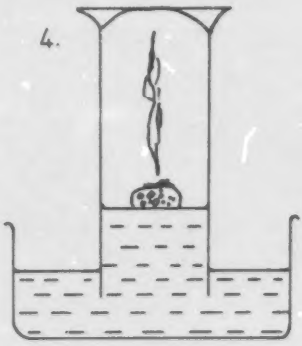


Some phosphorus was placed on a cork in a similar gas jar. The phosphorus was then ignited (diagram 3). As the phosphorus burned the water rose into the gas jar. When the phosphorus stopped burning (diagram 4) it was noted that the water level was the same as previously noted with the steel wool.

3.



4.

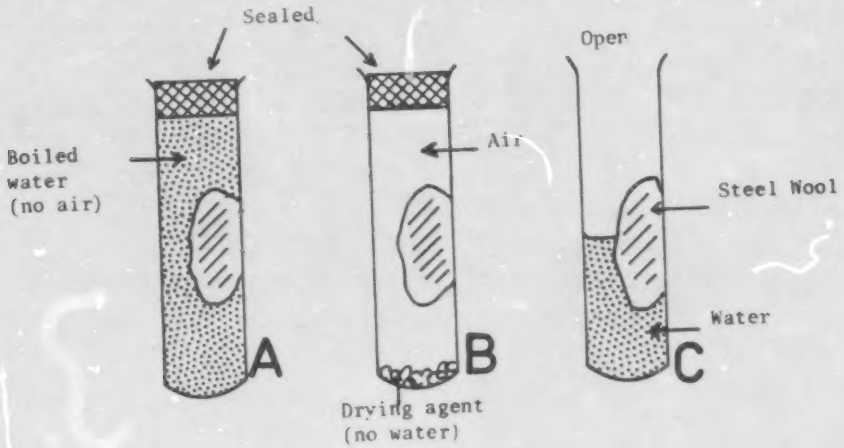


The similarity of the water levels would lead us to say that

A. air has leaked through the water into the gas jar.
B. the same thing in the air which is necessary for rusting is necessary for burning.
C. oxygen has escaped from the jar through the water.
D. carbon dioxide is produced by both of these experiments because each one involves burning.

The test tubes drawn below show the set-up of an experiment to study rusting.

It was noticed that the steel wool in tube C rusted while that in tubes A and B did not.



From this experiment you could conclude that

A. only air is necessary for rusting.
B. steel wool will rust in the presence of air and water.
C. substances will rust if water is present.
D. steel wool and water combine to form rust.

B5

156

In an experiment to determine how quickly water dripped from a container, students made the following measurements.

STUDENT	TIME	NUMBER OF DROPS
BOB	60 secs.	30
PETER	60 secs.	28
MARY	60 secs.	29
JOAN	60 secs.	32

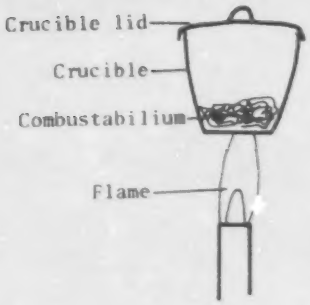
Which student is closest to the most acceptable result, all readings being considered?

A. Bob. B. Peter. C. Mary. D. Joan.

A3.

157

An experiment performed in a school laboratory involved burning the metal COMBUSTABILIUM in a crucible as shown in the diagram.



The aim of the experiment was to find how much of the combustabilium combined with oxygen gas from the air during the time that the metal in the crucible was heated.

The following results were obtained:

	Item	Mass (g)
Before Burning	Crucible Lid	7.91
	Crucible	30.73
	Combustabilium	24.32
After Burning	Crucible Lid + Product After Burning	79.96

Assuming that the only mass change was due to combustabilium combining with oxygen, the pupils should calculate that the amount of oxygen in the product after burning is closest to

A. 14 g.
B. 15 g.
C. 16 g.
D. 17 g.

D2. 158

The following table lists some of the properties of two chemicals *X* and *Y*.

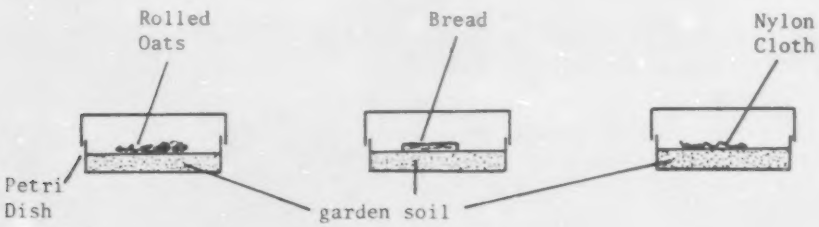
CHEMICAL *X*	CHEMICAL *Y*
white powder does not dissolve in water melts at 410°C reacts with acids does not react with *Y*	white powder dissolves in water melts at 960°C does not react with acids does not react with *X*

Equal amounts of *X* and *Y* were mixed and placed in a beaker. Acid was then poured onto the mixture. *Using the information above* you could definitely say that

A. *X* will react and *Y* will melt.
B. *X* will not react and *Y* will dissolve.
C. *X* will not react and *Y* will not dissolve.
D. *X* will react and *Y* will not melt.

D3.

A scientist placed rolled oats, bread and nylon cloth in three separate petri dishes which contained moist soil taken from a garden (see diagram).

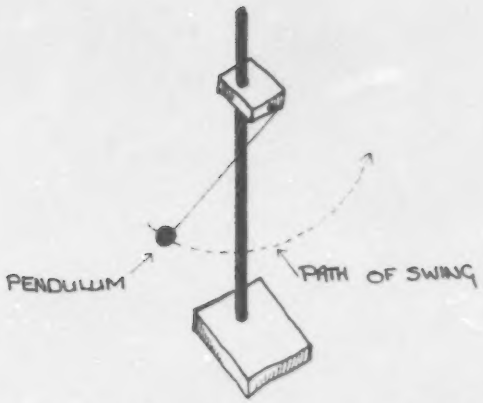


He placed the dishes in an incubator to keep them warm. After 3 days fungi were found growing on the rolled oats and bread. On closer examination the oats and bread were found to contain a large number of bacteria growing on them. The nylon was unaffected by the action of either fungus or bacteria.

From this experiment he could only conclude that

A. nylon does not decompose.
B. nylon takes longer to decompose than bread or rolled oats.
C. certain bacteria and fungi may decompose rolled oats and bread.
D. fungi and bacteria that decompose nylon were not to be found in the soil sample.

C1



The diagram above illustrates a pendulum set up for an experiment. The pendulum was allowed to swing and the number of full swings occurring in each minute was recorded. The string was then shortened and the observations repeated. The results were tabulated as below:-

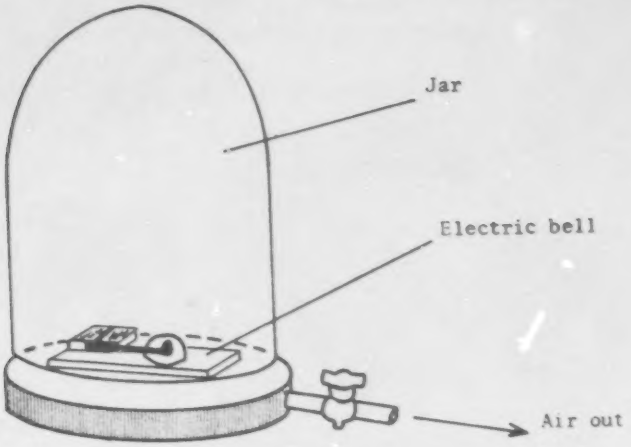
String Length	Number of full swings / minute			
	Trial 1	Trial 2	Trial 3	Average
1.0 m	29	31	30	30
0.6 m	38	40	42	40
0.4 m	50	50	50	50
0.2 m	72	70	68	70

From these results you could correctly conclude that the

A. larger masses produce greater rates of swing.
B. length of the pendulum has no effect on rate of swing.
C. mass of the pendulum has no effect on rate of swing.
D. small pendulum lengths produce greater rates of swing.

D4.

This question refers to this diagram.



The apparatus above shows an electric bell inside a large jar from which the air may be pumped out. As the air is pumped out of the jar the sound of the bell grows progressively fainter until it cannot be heard at all even though the bell is still working. The best conclusion we can draw from this experiment is

A. electricity cannot travel through a vacuum.
B. sound can travel only through air.
C. glass is a good absorber of sound.
D. air is necessary to transmit sound.

D.3

A student, who was fascinated by the way certain objects are attracted to magnets, gathered the following data:

OBJECT	ATTRACTION TO MAGNET	SILVER COLOUR
Gold ring	No	No
Brass tap	No	No
Iron nail	Yes	Yes
Copper kettle	No	No
Stainless steel knife	Yes	Yes

From this evidence, he concluded that all objects which are silver are attracted to magnets. Another conclusion he could have drawn is

A. coloured objects are never attracted to magnets.
B. iron and steel are attracted to magnets.
C. a magnet would not attract a gold plated knife.
D. there are more objects which are attracted to magnets than objects which are not attracted.

B.5

Three students each dropped different masses (50 g, 100 g and 150 g) in an experiment and calculated the acceleration due to gravity for each mass. They repeated the experiment another three times and tabulated their results as shown below:

Student	Mass	1st result	2nd result	3rd result	4th result	Average
1	50 g	10.2	10.1	10.0	10.1	10.1
2	100 g	10.0	9.6	10.2	10.1	10.0
3	150 g	10.1	9.8	10.0	10.1	10.0

The best conclusion that may be drawn from the above results is that the acceleration due to gravity

A. is 9.8 metres/sec/sec.
B. would be different on the Moon.
C. should not be averaged out.
D. does not depend upon mass.

D.3 164

SCIENTIFIC METHOD

The next four questions refer to the information below.

A student placed a lighted candle in a shallow pan of water. He inverted a bottle over the burning candle and performed the following three experiments:

I. He measured the time required for the candle to stop burning.
II. He then removed the bottle, relit the candle, filled the bottle with exhaled air, and again inverted it over the candle.
III. He repeated this second part of his experiment, but, before filling the bottle with exhaled air he ran 100 metres at top speed.

The probable purpose of these experiments was to show that

A. inhaled and exhaled air differ in composition.
B. exhaled air contains less carbon dioxide than inhaled air.
C. combustion releases heat and carbon dioxide.
D. respiration produces heat.

A.1

165

See further items on next page.

The next three questions refer to information on the previous page.

An observation which the student would make is that the

A. atmosphere exerts pressure.
B. atmosphere contains oxygen.
C. water rose inside the bottle.
D. inhaled air contains carbon dioxide.

C.1 166

As a result of the experiment the student might be justified in concluding that the exhaled air

A. contains carbon dioxide.
B. contains no oxygen.
C. has less carbon dioxide than inhaled air.
D. has less oxygen than inhaled air.

D.2 167

As a result of this experiment the student might also be justified in concluding that

A. activity results in a higher percentage of oxygen in exhaled air.
B. activity results in a higher percentage of carbon dioxide in exhaled air.
C. respiration is similar to burning.
D. respiration produces more carbon dioxide than burning.

B.2 168

A geologist makes the following four statements about an outcrop of rock on a hillside.

Which statement contains conclusions or deductions *without any observations?*

A. The sedimentary rock was deposited in marine conditions millions of years ago.
B. The outcrop consists of layers which vary in thickness from 3cm to 2m.
C. The sedimentary rock contains fossil shells millions of years old.
D. The sandstone layers contained vertical cracks.

A3. 169

The next question refers to this diagram.

1. The highest energy level in an atom may be called the valence energy level.
2. Electrons found in the valence energy level are called valence electrons
3. Do you really expect me to understand that!? *Now I know you are nuts!* First you tell me the world is round, now you tell me electrons found in the valence energy level are called valence electrons! You are truly unbelievable.
4. *Send in the Jester, he's better than you.*

Which portion(s) of the above cartoon conversation could be called a definition?

A. 2 only. B. 4 only. C. 1 and 2. D. 2 and 4.

A3.

Of the following statements, which one can best be regarded as a scientific hypothesis which could be tested by experiment within the next 10 or 20 years?

A. Many forms of cancer are produced by viruses.

B. An apple a day keeps the doctor away.

C. If you walk under a ladder it will bring bad luck.

D. The early Aborigines could communicate with each other by thought transference.

A5.

The next question refers to the following news items.

BEFORE PROOF COMES PLAUSIBILITY

JOHN PRYTZ, B.Sc., former American Air Force serviceman and currently Science Reference Librarian at the Parliamentary Library in Canberra, takes an optimistic view of the existence of flying saucers, the supposed substance of UFO sightings, in the first of two papers on the subject (the second begins on Page 36).

MANY TIMES in the history of our civilization , the introduction of a new thought has brought scepticism even ridicule. As it was with the idea of "stones falling from the sky" (meteors) in the 18th century and the concept of organic evolution in the 19th, so it is today with flying saucers.

"Once the fields of collective science agree that flying saucers are plausible, then (and only then) will the search for real proof proceed unabated."

"Frankly, they disappoint me".

Examine the headlines and cartoon above. From this evidence, which of the following statements is most correct.

A. All scientific theories begin with observations.
B. Before scientists will accept a theory it must be regarded as possible.
C. Once a theory is plausible, it is quickly proven correct.
B2 D. Scientists always use standard methods of scientific investigation to arrive at a theory.

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The next question refers to this quotation.

"Man has always held the past in high esteem, otherwise his knowledge of his environment would be limited to the experience of his own generation, and each individual would have to start anew his voyage of discovery through the complexities of nature." - *from "A Century of Scientific Progress".*

The statement confirms the need in science to

A. begin our discovery anew with each age.
B. take note of what early scientists have discovered.
C. record all our discoveries of the past.
B3 D. discover new things even if we do not record them.

173

A
We are gathered here today to perform a direct union. And what is synthesized here will forever be known as a Chemical Compound.
B
The higher you get, the colder it gets. And there's less air pushing down on you. That's why there's less air pressure.
C
Let's see! Isomers are like two houses with the same amount of wood ... but put together differently.
D
I wonder if the liquid detergent will break the surface tension. Hmmm, will a few drops of water do the same thing?
Liquid Detergent

Which cartoon character is making an explanation?

B4.

Which cartoon character is simply asking a question rather than proposing an hypothesis?

A
You'll be using some strong acids in this experiment, so be careful you don't burn yourself.
Let's see, I'm going to find out how metals react with acids ... Hey, I didn't know that vinegar is an acid! I'll bet that the metals won't react very much with vinegar!
B
Listen, if enzymes are so fussy, why do they hang around with dirt?
BIOS
CONTAINS ENZYMES
C
Why is one part of the flame hotter than the others? Does it have anything to do with the amount of oxygen you let into the burner?
D
Why does the sun change colour when it's near the horizon? The flames of the sun don't change colour do they?

The next seven questions refer to the information below.

In 1798, physician, Edward Jenner, noticed that a disease in cows, known as cowpox, was very similar to small pox, a disease which killed many people at that time, (1) The cowpox did not kill the cows. At that period of time (2) many people knew that they could protect themselves against killer diseases, like small pox, by deliberately infecting themselves by contacting a person known to have the disease in a mild form. This actually did give many people immunity from the disease.

(3) Jenner wondered if a person having been infected with the relatively harmless cowpox would then be immune to the smallpox. (4) He infected several groups of people with the cowpox, and after that disease had run its course, (5) exposed them to persons having mild and severe cases of smallpox. (6) None of them contracted smallpox. (7) Jenner decided that the cowpox and smallpox were caused by similar germs.

The Latin name for the disease cowpox is *Vaccinia* and it was from these experiments that the process of *vaccination* was developed.

Classify the seven statements numbered above using the table below.

Statement	A	B	C	D
1	Conclusion	Hypothesis	Observation	Result
2	Experiment	Hypothesis	Observation	Result
3	Experiment	Hypothesis	Observation	Result
4	Conclusion	Experiment	Observation	Result
5	Conclusion	Experiment	Hypothesis	Result
6	Conclusion	Experiment	Observation	Result
7	Conclusion	Experiment	Observation	Result

C3 C2 B5 B5 D4 A5

Read the following passage:

Several thousand years ago the Greeks argued about why matter behaves like it does. Aristotle had one way of explaining its behaviour and Democritus had another. Democritus said that *matter was made up of tiny, unbreakable particles*. Aristotle said that matter was not like this and that when a piece of matter was divided into smaller pieces, it could always be divided again.

The part of the statement above which has been underlined is best described as

A. an observation.
B. a fact.
C. an hypothesis.
D. a result.

C2.

The next five questions refer to the following information.

Lord Lister (1827-1912) was one of the first surgeons to attempt sterilisation of wounds and operating instruments. (1) At the time it was thought that infection in wounds and operation cuts was due to the action of microbes. (2) It was also thought that several diseases themselves were due to some form of microbe.

Lister (3) decided that infection would decrease if he could kill the microbes before they could get into a wound. At first he was too violent - (4) he dabbed the wound as he worked with lint soaked in crude carbolic acid, and had a spray of the same fluid playing over the operation. (5) He found that this often killed the tissue as well as the bacteria. (6) He then thought that milder forms of antiseptics may be more useful, or (7) perhaps heating in a hot flame instead of soaking in strong chemicals.

(8) After adopting these procedures, Lister's (9) fatalities from amputations fell from 43% to 15%. In his diary he stated that (10) infection in operations could be reduced by sterilising surgical instruments before operating, and by keeping a wound sterile.

How many statement underlined in the passage could be hypotheses?

C2 A. 3 B. 4 C. 5 D. 6 184

Which two statements refer to an experiment being conducted?

A. 2 and 3. C. 4 ard 8.
C3 B. 3 and 6. D. 5 and 7. 185

Which statement refers to the results of an experiment?

B3 A. 3 B. 5 C. 8 D. 10 186

Statement 7 is

A. an experiment. C. an observation.
B. a hypothesis. D. a result. 187

Which statement is a conclusion made from experimental results?

D4 A. 3 B. 5 C. 9 D. 10 188

After a robbery a detective looks for clues. Sometimes he may find a footprint in a garden which he then examines.
From the size and depth of the foot print he can tell how tall and heavy the suspect is.
At what stage does the detective make an hypothesis?

A. Searching for clues.
B. Finding a footprint.
C. Measuring the footp
D. Describing the suspect.

D.3

The next eight questions refer to the information below.

A pioneer in the reform of surgical techniques was *Semmelweiss*, a Hungarian physician who worked in the maternity wards of the General Hospital in Vienna. The mortality in those wards was appalling - up to twenty (20) deaths per hundred (100) births.

In 1840, Semmelweiss noticed that (1) mortality was very much higher in a ward where students were instructed than in one which was only attended by midwives. Later, he was suddenyl shocked by the death of a friend, who died from blood poisoning caused by a cut he received while he was making a post-mortem examination. The symptoms were very much like those of puerperal fever, the fever causing deaths in so many women after childbirth. Semmelweiss decided that (2) there was something produced in the decomposition of human tissue that caused these diseases, and that (3) the students carried it on their hands from the post-mortem room to the wards.

He noticed that the usual (4) soap and water dish did not remove the odour of putrefaction from the students' fingers. Also, he thought the (5) disease could be carried from diseased to healthy women in the same way. So, he gave instructions that, before any patient was examined, (6) the examiner must wash his hands in a solution of chlorine widely used for deodorising putrefying things at that time. (7) This was successful and (8) the mortality from puerperal fever fell very markedly in his wards.

Classify each one of the 8 numbered and underlined statements using the following code:

A - observation.
B - hypothesis.
C - experiment.
D - result.

Statement	1	2	3	4	5	6	7	8
Answer								

1. A5
2. B4
3. B3
4. A3
5. B4
6. C4
7. D5
8. D4

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191
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197

The next five questions refer to the information below.

Louis Pasteur investigated the problem of the disease *Anthrax*, which attacked sheep. He was curious to know why it recurred in the same fields, sometimes at intervals of several years.

(1) He noticed in a field patches of soil different in colour to the rest, where sheep which had died from *Anthrax* had been buried. (2) The idea came to Pasteur that worms travelling from the depths of the soil to the surface brought soil from around the carcass to the surface. (3) This soil could, therefore, contain *Anthrax* spores. (4) He dissected some of the worms from one of these patches of soil and inoculated some guinea-pigs with soil from inside the worms. (5) These guinea pigs contracted *Anthrax*.

Classify the statements numbered 1 to 5 according to the following code:

A - observation
B - hypothesis
C - experiment
D - result.

A	Statement 1	198
B4	Statement 2	199
B4	Statement 3	200
C5	Statement 4	201
D5	Statement 5	202

D. West, Government Printer, New South Wales – 1981